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BALLY MANUFACTURING CORPORATION
a Delaware corporation,

Plaintiff/Counterdefendant,

vs.

D. GOTTLIEB & CO., a corporation,
WILLIAMS ELECTRONICS, INC., a
corporation, and ROCKWELL INTERNATIONAL
CORPORATION,

Defendants/Counterplaintiffs.

) Docket No.
) 78 C 2246
)
)
)

) Chicago, Illinois
) March 15, 1984
) 10:30 a.m.

OCT 30 1984

U.S. District Court
Chicago, Illinois

VOLUME XIV-A
TRANSCRIPT OF PROCEEDINGS
BEFORE THE HONORABLE JOHN F. GRADY

TRANSCRIPT ORDERED BY: MR. JEROLD B. SCHNAYER
MR. MELVIN M. GOLDENBERG

APPEARANCES:

For the Plaintiff/
Counterdefendant:

MR. KATZ
MR. SCHNAYER
MR. MATHIAS
MS. SIGEL

DOCKETED
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For the Defendants/
Counterplaintiffs:

MR. LYNCH
MR. HARDING
MR. GOLDENBERG
MR. ELLIOTT
MR. RIFKIN
MR. GOTTLIEB

Court Reporter:

LAURA M. BRENNAN
219 South Dearborn Street, Room 1918
Chicago, Illinois 60604

THE CLERK: 78 C 2246, Bally Manufacturing v. Gottlieb, case on trial.

MR. MATHIAS: Good morning, your Honor.

THE COURT: Good morning.

MR. MATHIAS: Mr. Tone has a mandatory Court appearance this morning in the Federal District Court of Cleveland. He will be here for this afternoon's session but will miss this morning's session.

He asked me to report to you that he would have advised you of this yesterday had he known that his attendance would be mandatory.

THE COURT: All right, thank you.

JAMES SCHOEFFLER, PLAINTIFF'S WITNESS, PREVIOUSLY SWORN.

THE COURT: Good morning.

THE WITNESS: Good morning.

MR. LYNCH: Good morning, your Honor. May I proceed?

THE COURT: Good morning, Mr. Lynch. Yes, please.

CROSS EXAMINATION (Continued)

BY MR. LYNCH:

Q For the record, I would like to mark for identification the chart comparing Flicker, the embodiment of the '441 patent, Cleopatra and Spiderman as Exhibit 19-J, and as one brief clarification, Dr. Schoeffler, you indicated that the low beta transistor found some correspondence in the Gottlieb

1 games in the transistor with the resistor that current limited
2 the lamps during turn-on, correct?

3 A. That is my understanding, sir, that is correct.

4 Q. The slow turn-on transistor which gives the lag sensing
5 function did not find a correspondence in Cleo or Spiderman,
6 correct?

7 A. There is no slow turn-on transistor that is as slow as
8 the corresponding one in the Flicker game, that is correct,
9 sir.

10 Q. With respect to Cleo and Spiderman, furthermore, it is
11 the case that these solenoids that you indicated were not
12 driven can, indeed, be activated at any time during the game
13 cycle, correct?

14 A. That is correct, on the solenoid row, it is true of all
15 four entries, not actually just of the two, that some are
16 driven and some are not driven, and the direct drive ones can
17 be driven or caused to actuate, such as the flippers, at any
18 time.

19 Q. But in the Cleo and Spiderman, there are a great deal
20 more solenoids that are not driven, correct?

21 A. In the Cleo and the Spiderman, approximately half the
22 solenoids are driven under control of the microprocessor, the
23 other half not under the control.

24 All of them are enabled as a group by the
25 microprocessor, however.

Q They are enabled by the tilt switch, you mean, not being activated or by the initial turn-on switch?

A Well, but that is under microprocessor control.

Q In the context that the tilt is under microprocessor control and that when the tilt goes on, tilt switch goes on, the game shuts down, correct?

A That is correct, and without examining the program, it must also be true that when the game is over, these must be deactivated so that you can't play with the flippers, which is the identical procedure that is done in the Flicker game, sir.

1 Q I understand. The identical procedure that was done in
2 electromechanical games, correct?

3 A Yes, sir.

4 Q Now, but the point is, is that the half of the solenoids
5 that are not driven in the Cleopatra and Spiderman game,
6 those could be creating noise during a switch cycle, correct?

7 A In the same way that the solenoid not in the -- solenoids
8 not in the Flicker game that are direct driven, namely the
9 flipper solenoids, can be actuated at any time, that is, not
10 synchronized with the computations, they may be a source of
11 noise.

12 The major difference is, as indicated on this
13 chart, that the solenoids in the Cleopatra and the Spiderman
14 games are DC solenoids, with the steering diode across it.
15 So that the amount of noise, as we indicated in the testimony
16 yesterday in response to your question, is very much lower in
17 this case.

18 Q So Cleopatra and Spiderman do not avail themselves of
19 that advantage you discussed whereby the solenoid activation
20 is placed in a portion of the cycle remote from the switch
21 sensing. Correct?

22 A That is not quite correct, sir.

23 What I testified was not that the actuation of the
24 solenoids was, but it was at a point in time when the
25 solenoids were no longer activated.

1 Then in the Flicker game and program we took advan-
2 tage of that to do the long computational routines that might
3 have been subject to that noise.

4 In the case of the Cleopatra and Spiderman, the
5 same offset is done for the solenoids that are under control.

6 Q But not for the half that are not under control.

7 A For the direct driven ones, in both the Flicker and the
8 Cleopatra and the Spiderman, that is not done.

9 Q Now, you also indicated that there is a low beta
10 transistor finds some correspondence in Cleopatra and
11 Spiderman.

12 It is the low beta transistor that prevents the
13 onrush of current to the lamps that is specifically claimed --

14 A That is correct, sir.

15 Q -- in Claim 29 of the patent. Isn't that correct? And
16 I show you Exhibit 1.

17 A That is, specifically the Claim 29, in Claim 29.

18 Q So this item, that is, low beta on Exhibit 19-J, and that
19 you testified finds some correspondence with the transistor
20 and resistor, is specifically claimed in a claim not in suit,
21 correct?

22 A Claim 29 is not in suit.

23 A It is not in suit.

24 I am aware.

25 It is not in suit.

bl 1 Q Now, if you would step over to the Flicker game, please--

t 2 A Sir, that answer is -- my answer was incomplete there.
3 May I correct it just a bit?

4 What I said was in fact true, that claim 29
5 does claim that.

6 But the low beta transistor is one of the
7 noise prevention techniques which pervades the thesis and
8 appears in the other claims that are in suit.

9 For example, in claim 45, as we have testi-
10 fied, from the means plus function language, going back to the
11 operative matrix multiplexing, we determined that noise pre-
12 vention and noise immunity were part of those claims.

13 And the low beta transistor is clearly part
14 of those claims. So although it is specifically mentioned in
15 claim 29, it is also a part of claim 45 at least.

16 Q Well, now, you did testify about claim differentiation
17 yesterday.

18 A Yes, sir.

19 Q Now, according to claim differentiation, the low beta
20 transistor is mentioned in one claim, correct, specifically?

21 A It is specifically mentioned in claim 29.

22 Q It is not specifically mentioned in claim 45.

23 A It is in claim 45 through the means plus function
24 language.

25 Q It is not specifically mentioned in claim 45, correct?

2

1 A. The word low beta transistor does not appear in claim
2 45, that is correct, sir.

3 Q In fact, neither the word low beta transistor nor the
4 word, "so it acts as a current limiter during initial turn-on
5 of the lamp," that doesn't appear in claim 45, does it?

6 A The words do not. But in interpreting the means plus
7 function language, those words do appear in the patent, in the
8 specification. And so they are part of claim 45.

9 Q But they explicitly --

10 A. I agree that the words themselves do not appear in the claim, sir.

11 Q Would you step over to the machine, Doctor.

12 A Yes, sir.

(Brief interruption)

13 Q I believe that the left-hand connector on the logic
14 board is P1 and this is P2. Can you confirm that, Doctor?

15 A I can't remember. If it's important, we can look at the
16 photographs, because they have the --

17 THE COURT: Do you have a photograph of that?

18 MR. LYNCH: I think we have the photographs, your
19 Honor. That may help.

20 BY MR. LYNCH:

21 Q (Showing photographs.)

22 A Oh, I see. Yes, that's more direct, that is correct.
23 That is P1 on the left.

24 Q Now, I call your attention over here to two yellow
25 wires which appear to go nowhere and appear to have been

3

1 cut, right here; and several other wires in the region of the
2 upper right-hand corner of P2 that appear to have been cut.

3 A I can't actually see those.

4 Would you have the photograph of the back,
5 sir?

6 A It's actually more difficult in the photograph.

7 Let me point right here. (Indicating)

8 A Oh, yes. Yes, sir.

9 Q Here, here. (Indicating)

10 Do you see those cut wires?

11 A I do, sir.

12 Q Had you noticed those before?

13 A No, sir.

14 Q Do you have any idea what the configuration -- the cut
15 wires would indicate that at some time this machine was in
16 a different configuration, would it not?

17 A This was a prototype machine, and in the process of
18 building it -- without being present, I have no idea what
19 those positions on the pins are for, why the wires would have
20 been put on taken off or cut or a mistake in wiring or, I
21 don't know, sir.

22 Q You've never had an explanation of those?

23 A I was not even aware that they existed, sir.

24 Q Fine. Now, let's get to that matter of the operator
25 adjustable switches on the back of the machine.

1 A Yes, sir.

2 Q Now, the operator adjustable switches are not switches
3 in the same context; they involve putting these plastic
4 connectors on these posts, correct?

5 A That's it, sir. For example, this pair of yellow wires
6 goes through the board, and there is a steering diode behind
7 the board, and so that's a closed circuit.

8 And when you plug the two ends between, for
9 example, this pin and this pin, this puts a short circuit or
10 a connection which would be the same effect as a mechanical
11 switch that turns on the light. It would allow current to
12 flow through.

13 Q And so the Court would understand, if we took the two
14 yellow ones, the two yellow ones and the two red ones would
15 be used with this series of posts, and let's say we awarded
16 an extra game at 30,000 points.

17 A All right, sir.

18

19

20

21

22

23

24

25

1 Q The appropriate for the first game would be the yellow
2 ones. We would connect them on the post here and the post
3 here, so that the crossing of those two posts would yield
4 30,000 points, is that correct?

5 A That is correct.

6 When the microprocessor scans those switches, it
7 would detect that closure and would know that that is what
8 you intended to do.

9 Q Now, once we did that -- as to be the red wires, correct?

10 A Could do that. Of course, that was not.

11 Q Once we did that and put the yellow ones here on the
12 30, if I may do that, and the other yellow one here on the
13 30, we would be saying, well, the 30,000 points, you have
14 got an extra game, with this connection, correct, or you get
15 something, an extra ball, an extra something?

16 A That is my understanding. I have never actually seen
17 all the game rules of the Flicker pinball machine, but that
18 is my understanding. That sounds reasonable.

19 Q Now, once you do that -- one had to put another score--
20 well, let's see. Can the Court see this? the other one 65 or 60.

21 Now, once you do that, it is the case that if you
22 want to hook up the red wires to, say, you get two balls at
23 a higher score, that would be what the red wires would be
24 for, for a different award, correct?

25 A I do not know that that is true.

1 In other words, I do not know whether the Flicker
2 game -- the game rules had the option of multiple choices
3 there or one. I have no way of knowing that, sir.

4 Q There is another set of wires here, and if you look on
5 Exhibit 52, you see that there is a suggestion that you can
6 use two jumpers on the score, little score switch arrangement
7 here, correct?

8 A Yes, sir.

9 Q Now, the other ones appear to be the red wires, correct?

10 A Yes, sir.

11 Q Now, if we put the red wires and wanted to select
12 another score, we would have to select another score that
13 was neither in the same row nor in the same column with
14 the 30, correct?

15 A I do not understand why you drew that conclusion, sir.

16 Q How can we put this connector on the same post?

17 A That appears to be the physical limitation that is
18 there, sir.

19 Q So one would have to, if one had to put another score--
20 well, let's say, well, let's make the other one 65 or 60.
21 60 is up here.

22 A Yes.

23

24

25

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1 Q So to do that, and I keep undoing the 30 -- but to do
2 that, one would say, well, let's put one red one over here and
3 one red one over here, correct?

4 A That is what you have done, sir.

5 Q Now we have got a different award at 60,000 points or
6 60 points or something, correct?

7 A If that is allowable by the game rules, yes, sir.

8 Q Now, let's look at a second jumper.

9 Yes. A second jumper says you can put a jumper on either
10 5 Ball or 3 Ball.

11 A That is correct, sir.

12 Q That appears to be -- it either goes in this position or
13 that position?

14 A That is correct.

15 Q Now, another jumper goes either on game, ball, on, or
16 off?

17 A Yes, sir.

18 Q Or in the matrix shown in the patent actually, the way it
19 is indicated, it would go on match, replay, add-a-ball, or
20 straight?

21 A That is correct, sir.

22 Q Then we also appear to have jumpers that will work on
23 the credit and the coin operations as shown in Exhibit 52,
24 correct?

25 A That is correct, sir.

1 MR. LYNCH: You can return, Dr. Schoeffler.

2 (Brief interruption.)

3 BY MR. LYNCH:

4 Q Looking at that, Dr. Schoeffler, we see here on the mux
5 chart, Figure 4 of the patent, an arrangement of those
6 thousand switches that is identical to the arrangement we saw
7 in the back of the Flicker, correct?

8 A Of the thousand switches sir?

9 Q Yes, the 30 is over here.

10 A I see.

11 Q The 60 is here.

12 When we activated the 30 on the back, we put one
13 connector on a pin here and one connector on a pin that was
14 physically here, and that meant 30, correct?

15 A That is my understanding of that connection, sir. I did
16 not trace the wires, but I believe that is correct.

17 a sneak path?

18 A A sneak path.

19 a sneak path.

20 a sneak path.

21 a sneak path.

22 a sneak path.

23 a sneak path.

24 a sneak path.

25 a sneak path.

1 Q We said we could not put another connector in the same
2 column or the same row, correct?

3 A Because of the physical arrangement of the plug.

4 Q So physically in this part of the operator adjustable
5 matrix, is it possible, Doctor, to have a sneak path?

6 A A sneak path totally restricted to the left-hand part?

7 If you cannot have 2 switches in the same column --

8 Q Or the same row.

9 A -- or the same row, there could not be a sneak path in
10 the left-hand part of the matrix.

11 Q When we add the fact that we are also going to connect
12 one switch in the next column marked Column A --

13 A Yes, sir.

14 Q -- match, replay, add-a-ball, or straight --

15 A Yes, sir.

16 Q -- can any combination of closed switches here give you
17 a sneak path?

18 A A sneak path totally in the left-hand part of the switch
19 matrix --

20 Q From Row A over.

21 A -- cannot occur.

22 Q It cannot occur in those switches, correct?

23 A Totally restricted to that part of the matrix, that is
24 correct, sir.

25 Q The fact is, however, Doctor, that you testified that

1 there are isolation diodes in this part of the matrix, correct,
2 the left-hand part where no sneak paths can occur?

3 A. Those are readily observed on the board and in the
4 diagram here. Yes, sir, they are there.

5 Q. In fact, they are not diodes at each location in this
6 matrix. They are diodes on the ends of each of those wires,
7 correct, Doctor?

8 A. And that is where they should be because the diodes are
9 placed with the switches. At a location in the matrix where
10 there is no switch, it would hardly be appropriate to put a
11 diode.

12 Q. But those diodes in this part of the matrix are in a
13 part of the matrix where there cannot physically occur a sneak
14 path, correct?

15 A. They are in the part of the matrix where a sneak path that
16 is totally within that part of the matrix cannot occur.

17 Q. In the right-hand part of the matrix -- well, by adding
18 the other 2 wires to the credits and the coins, a sneak path
19 cannot occur either?

20 A. Totally in that portion of the matrix, is that your
21 question?

22 Q. That is correct.

23 A. Then that is correct, as I have said several times.

24 Q. Is there any arrangement of operator switches back there
25 that could cause a sneak path to occur?

1 A The total sneak path within the left-hand part of the
2 circuit, is that your question?

3 Q Within the entire operator control portion of the circuit.

4 A That is the left-hand portion of the switch matrix.

5 Q That is correct.

6 A As I see the switches, it is impossible to have a sneak
7 path where the entire sneak path is in that portion of the
8 matrix, that is correct.

9 It is possible if you did not have the ability to have the
10 switches on the left-hand part of the matrix,
11 only you put those wires on, since they are operator adjust-
12 able switches, are closed all the time, if you did not have
13 the ditches there, you would increase significantly the possi-
14 bility of sneak paths.

15 That is why they are there and not over here.

16 What you are saying, Doctor, in this arrangement with
17 these wires of the matrix blank, it is impossible to have a
18 sneak path by cooperation of switches resulting from the
19 operator adjustable switches, isn't that correct?

20 In this arrangement as shown in Figure 4, you
21 can't get a sneak, can you, Doctor?

22 A Sir, are you talking about the entire or

23 part of the matrix about with this arrangement of wires,
24 Doctor.

25 A You are talking about the entire 4 by 16 matrix of

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rect 1 Q Is it possible for this part of the matrix to cooperate
2 with the right-hand part of the matrix, the playfield switches,
3 to develop a sneak path?

4 A That is why the duct steering diodes are in the left-
5 hand part of the matrix because to have a sneak path, which
6 means you will read a switch erroneously, what you require is
7 an L-shaped set of closed switches, and they can be in any two
8 columns of the matrix and two rows of the matrix. So it might
9 be possible if you did not have the diodes to have that, and
10 since those switches on the left-hand part of the matrix,
11 once you put those wires on, since they are operator adjust-
12 able switches, are closed all the time, if you did not have
13 the diodes there, you would increase significantly the possi-
14 bility of sneak paths.

15 A That is why they are there and not over here.

16 Q What you are saying, Doctor, in this arrangement with
17 these items of the matrix blank, it is impossible to have a
18 sneak path by cooperation of switches resulting from the
19 operator adjustable switches, isn't that correct?

20 Q In this arrangement as shown in Figure 4, you
21 can't get a L shape, can you, Doctor?

22 A Sir, are you talking about the entire --

23 Q I am talking about with this arrangement of switches,
24 Doctor.

25 A You are talking about the entire 4 by 16 matrix of

switches?

Q Yes, you cannot get a sneak path resultant from whatever you do on the operator-controlled switches?

A What is my understanding of this and what I am trying to testify to is that -- you selected which switch to be closed as your example?

Q 30 and 60.

A If, for example, the 30 switch were closed and when you scan this column, a sneak path might arise -- if we just at random pick a set of switches in this part of the matrix, if one had this closed, this closed, and this closed (indicating) and did not have diodes, then it would be possible to have a sneak path to read at here (indicating), but with the --

Q A sneak path --

A I must think about my answer to see that I am answering correctly.

(Brief interruption.)

BY THE WITNESS:

A Thank you for waiting. Would you now repeat the precise question again?

BY MR. LYNCH:

Q Just so we understand what a sneak path is, Doctor, if we have three switches closed, some of them presumably stuck, let's say switch 13 on Exhibit 13-E is a valid closure, the correct?

1 A Yes, sir.

2 Q Now, the way these go is that the vertical lines are
3 not attached to the horizontal lines at their cross points,
4 right?

5 A That is correct.

6 Q So if this is closed, current could go like this
7 (indicating). If 12 were stuck and if 22 were then closed,
8 that would be a sneak path if 12 were stuck, correct?

9 A We are reading which column in your example, sir?

10 Q Let's say we are reading the column that has 13 and 23
11 in it.

12 A All right, and 13 is closed.

13 Q 13 is closed.

14 A But 23 is open?

15 Q 23 is open.

16 A In that case, if there were no diodes there, we would
17 read that the sneak path is present, and hence, we would
18 erroneously read 23 as closed because it sneaks around and
19 looks like it is connected to ground, that is correct, sir.

20 Q The reason the diode helps is because I did this yellow
21 matter, and as I came to 22, I couldn't go across that diode,
22 correct? The diode would prevent me from conducting or from
23 closing switch 22, from passing in that direction, correct?

24 A The result of what you said is correct. You drew the
25 whole sequence backwards, however.

Q. Undoubtedly I did.

A. But that is correct, that is a sneak path if there are no diodes.

Q. A sneak path?

A. Well, the sneak path is the path that goes from the input and the output, and if the diodes are not there, they can be anywhere. The sneak path is the path that goes from the input and the output, and if the diodes are not there, they can be anywhere. The sneak path is the path that goes from the input and the output, and if the diodes are not there, they can be anywhere.

Q. Is it a sneak path?

A. Yes.

Q. As I said, I am quite sure, I believe it was.

A. Now?

A. I believe when it was a separate unit, it was a unit that has the diodes in it, and then a year or so later, they were so that the diodes would be there.

Q. But you think it would be correct if there were diodes in the unit, and it would be correct?

A. I think so.

Q. The sneak path is the path that goes from the input and the output, and if the diodes are not there, they can be anywhere. The sneak path is the path that goes from the input and the output, and if the diodes are not there, they can be anywhere. The sneak path is the path that goes from the input and the output, and if the diodes are not there, they can be anywhere.

A. I believe it was a separate unit, it was a unit that has the diodes in it, and then a year or so later, they were so that the diodes would be there.

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1 Q The fact of the matter is to get a sneak path, you need
2 a closure of switches in an L-shape?

3 A That is correct, sir.

4 Q A connected L-shape, correct?

5 A Well, the horizontal part of the L must be in the same
6 row and the vertical part of the L must be in the same column.
7 They can be anywhere in the matrix; you are correct, sir.

8 Q Can any arrangement of these switches result in a sneak
9 path?

10 A In the entire matrix?

11 Q Yes.

12 A As I look at it quickly here, I believe it can.

13 Q How?

14 A I believe what it would require would be reading a column
15 here that has the diode in it and then a pair of switches over
16 here so that the L would cause that.

17 Q But then that could be cured if there were diodes on the
18 playfield switches, correct?

19 A Absolutely.

20 Q The sneak paths which could result from two simultaneous
21 switch closures and a stuck switch on the playfield of Flicker
22 as a result of 3 balls on the playfield would similarly be
23 solved by diodes in the playfield switch matrix of Flicker,
24 correct?

25 A As disclosed in the specification, that is the way to

1 solve that problem, that is correct, sir.

2 Q So doesn't it appear, Doctor, that if one were to use
3 isolation diodes on the Flicker and if one were to attempt to
4 use them to prevent sneak paths, then indeed they should have
5 been used on the playfield of Flicker?

6 A Exactly why Frederiksen did not put them on the playfield
7 of Flicker and why he disclosed them in the specification, I,
8 of course, have no way of knowing; but if they can occur and
9 if they had been put on the playfield, then the possibility of
10 a sneak path would be eliminated.

11 Q Your testimony was that, at Page 1666, "When sneak paths
12 are present which would permit you to read a switch closed
13 which was not closed, the diodes are essential."

14 Do you agree with that?

15 A They are essential in order to avoid the sneak path, that
16 is correct, sir.

17 Q You just indicated "essential." Thank you, Doctor.

18 Only one more matter.

19 You looked at the back of the Flicker game and I
20 have had blown up Exhibit 52.

21 Now, when you testified about this previously, I
22 would like to explain to the Court briefly what this means.
23 This is an arrangement, is it not, Doctor, where if I were to
24 draw a box (indicating) around the components, everything
25 within the green dotted outline on the large Exhibit 52 would

1 be on the mother board?

2 A. That is the convention for doing that, and so if that

3 diagram is accurate, it would be that way.

4 integrator?

5 rect?

6 A. Yes, I believe that is correct.

7 distant with the

8 day, is that correct?

9 trace the wire up there?

10 So it is rectified?

11 Q. And the output is going to the

12 on to the

13 correct?

14 A. That is correct.

15 Q. Is it a connector

16 for, and I believe that is what I am

17 going to see through to go

18 to input.

19 A. That is correct.

20 Q. The signal comes off of

21 the 11 and goes to variously on

22 the 11 and goes to the

23 parallel,

24 A. That is correct.

25 draw that

1 Q Out here where it says this goes to the playfield and
2 this goes to the playfield and over here from P2 and P1, we
3 have connections to the logic board or the IC components, the
4 integrated circuits components, in the microprocessor, cor-
5 rect?

6 A This diagram at the bottom is certainly labeled con-
7 sistent with that.

8 The upper left-hand corner, as I testified yester-
9 day, is not labeled consistent with that. But since I did not
10 trace the wires, I do not know what the situation is up there.
11 So it is hard to interpret that.

12 Q According to this drawing, from the playfield we come
13 on to the mother board from various playfield switches,
14 correct?

15 A That is what the diagram shows, sir.

16 Q It indicates that these switches should go to connector
17 P2, and let me mark the switches as A -- strike that -- I am
18 going to mark them improperly as A -- inputs 2 through 8 go
19 to inputs, it appears, 2 through 8 at P2, correct?

20 A That is what the diagram shows, sir.

21 Q The diagram then indicates that the signal comes off of
22 the IC board and come through P2, is processed variously on
23 the mother board, and exits the mother board, P4, to the
24 playfield, correct?

25 A This is where the diagram is ambiguous, so you cannot
draw that conclusion. It is inconsistent.

1 A The arrows on the lines indicate that is the direc-
2 tion of a signal, but the labeling of the lines are incon-
3 sistent with that.

4 A Yes. So I do not know what happens.

5 A Yes. There at the playfield end, those are consistent
6 with the game.

7 A The only ambiguity in this diagram is whoever drew
8 it-- the date on this is December, long after the fact. What
9 happened up there and what the real connections are up there
10 is not clear from what is on this diagram. That is all I can
11 say.

12 Q The diagram indicates right now that a series of inputs
13 came off the logic board at mux zero -- I mean, at connec-
14 tions 2 through 8 of pin 2 and go off at pins 2 through 8 of
15 pin 4, correct?

16 A But that is inconsistent with the labels. Mux zero are
17 on this board, and so they either came off the other board
18 or they didn't, but that is totally inconsistent. Usually,
19 you can draw any conclusion you would like from what is on
20 this diagram.

21 Q Let me give you a supposed, Doctor.

22 A All right.

23 Q Suppose there were two synchronous decoders.

24 A Two synchronous decoders?

25 Q Both generating mux signals.

1 A What do you mean by a synchronous decoder, sir?

2 Q That they are operating in synchrony.

3 A Oh, in parallel?

4 Q Yes.

5 A Yes, sir.

6 Q Then the switch matrix would be driven from the position
7 I have indicated as A on P2, correct?

8 A It could --

9 Q With your supposition, you are assuming the
10 second synchronous decoder is on the CPU board with the first
11 one.

12 Q Well, that is where it would logically be, wouldn't it?

13 A That is correct. I am just checking your supposition
14 and then those would go to the switch line, that is correct,
15 sir.

16 Q Now, that would indicate then that the lamps and digits
17 were being driven from the collector of the transistor, which
18 comes off pin 1 of connector P1, correct?

19 A And labeled mux zero to F as are the ones up here.

20 Q

21

22

23

24

25

1 Q Labelled Mux Drive.
2 A The signals from the CPU board are labeled Mux Drive.
3 See, and with your supposition now, that's still in-
4 consistent.

5 If there were two running in parallel for some
6 reason, and they brought them through twice, it would be
7 more consistent to have labeled mux drive up on the upper
8 left also.

9 Q Except it is true that the components being driven from
10 P2 require more driving than do the switches being driven
11 from -- strike that.

12 What It is true that the lamps and digits require more
13 driving than do the switches, correct?

14 A That's not quite correct, sir.
15 By driving, we mean the signal from the decoder.
16 That's a very light current signal.

17 What is needed is power to light the lamps. And
18 that's supplied actually from this slow turn-on transistor
19 labeled 2N6043 in the left-hand corner of the diagram.

20 Q One last question, Doctor: Did you notice as to whether
21 or not there are wires that jump from the collector of
22 this 2N6043 connector down in the right-hand corner, and jump
23 up to the area of P2 on the mother board?

24 A I did not trace the wires, sir.
25 What I observed in the computer program is that

1 when a column is selected there is only one place in that
2 computer program that a column is selected, and hence the
3 column of switches, digits and lamps are all enabled at
4 exactly the same time.

5 MR. LYNCH: I don't have any further questions,
6 your Honor.

7 CROSS EXAMINATION

8 BY MR. GOLDENBERG:

9 Q Doctor, do you know how that Flicker game works?

10 A I've studied the game, sir, and I believe I understand
11 the operation of the game.

12 Q What have you studied, sir?

13 A I've studied the schematics of the Flicker game, and I
14 have studied the program submitted which is part of the
15 patent.

16 I've observed the game itself, and I listened to
17 Frederiksen's testimony.

18 Q Now, one of the schematics you studied is this exhibit
19 Mr. Lynch was just asking you about. Isn't that correct?

20 A That is correct, sir.

21 Q And that's ambiguous.

22 A The exact way the wiring is laid out is ambiguous because
23 of the labeling in the upper left-hand corner.

24 That has nothing to do with my understanding, how-
25 ever, of the operation of the game, sir.

1 Q Okay. So you start with an ambiguous drawing, but you
2 understand that.

3 And then we go to a Flicker game where you haven't
4 checked the circuits. Do you understand that?

5 A I stated that I did not trace the wires on all those
6 boards, yes, sir.

7 Q And then you made mention a moment ago of the computer
8 program, and you studied that. Do I understand that, sir?

9 A That is correct, sir.

10 Q And we know now, all of us, that that computer program
11 is inoperative. We know that, don't we?

12 A The computer program that was dumped from the PROMs in
13 the Flicker is a debugged version of the program that was
14 submitted to the Patent Office and is part of the patent.

15 I have referred to the other related things which
16 have been referred to at length, and the use of the schematic,
17 the use of these programs that I indicated I did, and my
18 knowledge of the Flicker are sufficient to determine that
19 there is no circuitry in the Flicker.

20 I have indicated as to the fact that I have
21 made a review of the circuitry of the Flicker. I have no part in
22 the fact that the circuitry was not checked. I have no knowledge of that.

23 There was no testimony that I had seen
24 the circuitry of the Flicker.

25 I have read the Flicker, the references I

patent Q Well, the computer program you had reference to was
2 Plaintiff's Exhibit 30 and Plaintiff's Exhibit 436. Isn't
3 that correct?

4 A That is correct, sir.

5 Q And so that's the program listing you studied.

6 A That is correct, sir.

7 Q So based on an ambiguous drawing, complicated or rela-
8 tively complicated piece of electronic equipment, circuits
9 you've never checked, and an inoperative computer program
10 listing, you know how that game works over there. Is that
11 your testimony?

12 A I studied the Flicker game in order to be able to read
13 the claims in suit on that game.

14 And the claims in suit refer to matrix
15 multiplexing and they refer to the other related things which
16 I've testified to at length, and the use of those schematics,
17 the use of these programs that I indicated I used, and my
18 examination of the Flicker are sufficient to determine that
19 those claims do indeed read on Flicker.

20 I believe I never testified as to the exact sequence in
21 which hardware was put together or wired. I had no part in
22 that. I was not around. I had no direct knowledge of that.

23 And there was no testimony that I ever saw
24 that was related to that.

25 So in reading the claims, the materials I

1 looked at are sufficient to understand the operation of that
2 game, the single matrix and all of the other related things.

3 Q Sir, could you answer my question? Is it your testimony
4 that, based on ambiguous drawings, electronic circuitry that
5 you have never checked, and your understanding of an inopera-
6 tive computer program, you know how that Flicker game works?

7 A Which of my testimony --

8 Q Could you answer my --

9 A -- are you referring to?

10 Q Sir, could you answer my question? If you want to give
11 an explanation, please do that. But answer my question yes
12 or no.

13 A May I ask for a clarification?

14 Q You said my testimony --

15 Q I'm asking --

16 A -- and I don't know specifically what testimony you
17 gave, because I never testified --

18 Q Let's have your testimony, then. --

19 Do you understand how that Flicker game works?

20 A I believe I understand how the Flicker game works, sir.

21 Q All right, sir. Now, what -- and am I correct that the
22 basis of your understanding is your study of ambiguous
23 drawings, no study of the machine itself, and a study of an
24 inoperative computer program? Am I correct?

25 A No, sir, not quite. Not precisely correct.

ect. 1 Q All right, sir. What else?

2 A You said no study of the machine itself.

3 I looked at the machine, I played the machine, and
4 saw the way it operated. I did not trace the circuits in
5 the diagram.

6 By looking at the computer program and observing
7 the structure of the computer program the way the columns are
8 enabled, the sequence in which lamps are lit and --enabled
9 and lit, when switches are read, et cetera, I came to an
10 understanding of the operation of the Flicker game which
11 has not changed based upon any further study of the program
12 that is actually in the Flicker and is not affected by this
13 ambiguity in the upper left-hand corner.

14 Q Well, can you and I agree, sir, that the computer program
15 listings that you have studied, Plaintiff's Exhibit 30 and
16 436, are inoperative and are not -- do not represent the
17 computer program in the Flicker game?

18 A No, we cannot, because of the last clause that you
19 added to your question.

20 The difference -- let me rephrase it.

21 The program that is in the Flicker PROM presumably
22 right now -- and that program is the same program; the only
23 difference is a few changes in instructions for debugging
24 purposes, and one does not conventionally in the industry,
25 when we are talking about programs, mean that those are
different.

1 There are instructions that are different, but they
2 do not change the structure, they do not change the opera-
3 tion of that game in any way that is relevant to the claims
4 of this patent or the disclosures in the patent.

5 Q All right. Let's put computer talk aside and let's
6 try to talk English.

7 Exhibits 30 and 436, does that represent the
8 computer program loaded into that Flicker game?

9 A The structure, the sequencing, and everything else in
10 the exhibit is the same as what is in the PROMs right now.

11 There are differences. The bugs that were in that
12 program have been removed since this.

13 But they are not major, they are not structural,
14 and they do not affect anything that I have been able to
15 determine that is at all significant in the operation of
16 the pinball game itself.

17 Q All right, sir. I think we're in agreement. You've said
18 they were different.

19 A I did not say that the programs were different. I said
20 there was instruction change in the program in the ROM.

21 Q Aren't there omissions in the exhibits, in Exhibits 30
22 and 436?

23 A Omissions, sir?

24 Q Yes, sir.

25 A In the program that was submitted to the patent office

1 is the symbolic version of the program.

2 Q Can you answer my question, sir? Aren't there
3 omissions?

4 A I'm trying to answer the question, sir.

5 The program that was submitted to the patent office
6 is the symbolic version of the program.

7 What appears in the ROMs in the Flicker board is
8 of course what is called the object code version. And in the
9 process of creating the object code version, the patches or
10 changes or bugs were added to it.

11 And so if you count instructions and match up
12 instructions, although most of them are the same, there are
13 additional things in the ROM that do not appear in the sym-
14 bolic program. That is a normal part of patching or de-
15 bugging a computer program.

Q Sir, don't you recall Mr. Frederiksen's testimony in this case that Exhibits 30 and 436 represented -- I am sorry -- was a listing of what was in the ROMs of the Flicker game?

A I do not recall the exact words he used, which are relevant the way you have worded your question, sir.

Q I thought -- my recollection of what he said is that that is the program that is in the Flicker.

Q Well, let me read this to you, and this is from Page 253 of the transcript on January 4.

Q I show you Plaintiff's Exhibit 30. Can you identify it?

A Yes. This is the program essentially as it existed at the time of the demonstration for the Bally Flicker.

Q Is this the program that you submitted as part of your original patent application? Can you tell us that?

A I believe so. Now, the fact is it is not the program.

A As he said, it is essentially the program.

Q It is not identical, is it not?

A There have been bugs removed in that program, and so there are instructions that are different, that is correct, sir.

Q All right, sir, let's go on to another topic.

1,2

1 I recall in your testimony earlier in this proceed-
2 ing you made reference to an experience you had consulting or
3 working for Ford Motor Company.

4 Do you recall that, sir?

5 A. Yes, sir.

6 Q. When was that?

7 A. My involvement with Ford, as best I can recall, without
8 going back and checking precise dates, was probably '71 or '72,
9 and that went on actually to the present day.

10 Q. Now, do I understand correctly that you were part of a
11 team that was exploring putting microprocessors in automo-
12 biles, is that correct?

13 A. I was consulting for the team and then doing research in
14 the University funded by that team.

15 More than microprocessors, that project started out
16 using -- because microprocessors were not available when the
17 project started. They were actually looking and were driving
18 cars and installing minicomputers, larger size computers, to
19 do that.

20 As the project evolved, it was replaced with a
21 microprocessor, which is essentially what is in the Ford
22 automobile today.

23 Q. You consulted with that team?

24 A. That is correct, sir.

25 Q. I think you told us that there were persons of educational

1 and professional attainment, such as yourself, men with
2 graduate degrees, and a great number of them, and many, many
3 dollars were spent?

4 A. That project was carried out in the Ford Motor Research
5 labs where almost all the people in the labs are of that
6 level, sir.

7 Q. Did I understand correctly that what you were trying to
8 do and telling us about that was to contrast it with Mr.
9 Frederiksen's ability or achievement of putting a microproces-
10 sor in a pinball game, is that correct?

11 A. One of the major reasons I had brought up that subject,
12 sir, was because of the discussion of the constraint that
13 Frederiksen mentioned of working with the components in the
14 pinball game as they exist that were not -- that we were
15 unable to change, because in that project, there was no limit
16 to what could be modified in the engine, the engine design,
17 or the controls of the engine, in order to make that real
18 time system functional.

19 So there were far fewer constraints and certainly
20 no economic constraints at that stage. It was still a research
21 project at that stage.

22 So whether it was feasible or not was incidental to
23 the project until a later stage it moved into production.

24
25

Schoeffler - cross

1b1

1 Q Now what was this computer, of any size, whether it be
2 a microprocessor or a mini computer, what was it going to do
3 in an automobile?

4 A In the Ford automobile?

5 Q Yes.

6 A I am not a mechanical engineer, so you will have to
7 accept my memory of what it is. The computer on a periodic basis was going to
8 read the pressure as it existed somewhere in the engine, which
9 then would vary whether you were driving the car in the
10 mountains or down in the desert, and it affected the way the
11 engine was working.

12 It was measuring, as I recall, at least a
13 couple of temperatures somewhere in the engine.

14 It was measuring the speed of the engine.
15 As I recall, it was measuring the actual speed
16 of the car, counting as the wheels rotated, and the driver's
17 position on the gas pedal.

18 The computer was then supposed to do two
19 main functions in its control. One was to manipulate what was
20 called the exhaust gas recirculation valve. That is the
21 device that the EPA agency requires on cars to prevent pollu-
22 tion. The usual valve is not adjustable at all, but a special
23 one was put on the engine that the computer could adjust.

24 Then it was going to also adjust exactly where

Schoeffler - cross

in the cycle as the piston moves up and down that the spark plugs would fire, so that the car would get the best possible response in the sense of driveability without failing the emission test.

Those were the major objectives. In addition, the computer was responsible for error recovery; namely, if you were driving the car and the computer failed, the car was constrained, as I recall, to be driveable but not pollute, and that produced all kinds of problems, which required custom computerr chips to be designed.

It was a very complex real time system.

Q Very complex real time system.

A If I have kept up with you correctly, I have it measuring or ascertaining pressure, two temperatures, speed of the car, speed of the engine, and the driver's position on the gas pedal, am I correct, sir?

A I mentioned those. I don't know if there were others.

Q Might have been others.

A I can't remember, but those were the essential ones, sir.

Q So that is at least six input variables, right?

A That is correct, sir.

Q It was going to control two outputs, the spark plug and this exhaust gas recirculation valve, right?

A That is my recollection, sir.

Schoeffler - cross

1 Q There were problems doing that, isn't that right?

2 A Yes, sir, because the car had to operate even when the
3 engine was running very fast.

4 Q How do you contrast that kind of effort, those kinds of
5 problems, when all you are trying to do in a pinball game is
6 determine whether or not a switch is closed and light a light
7 or register a score?

8 A If all I had to do in a pinball game was sit there and
9 watch the switches and determine when they closed and when I
10 found one go off and light a light, none of us would be here.
11 That is not the situation in that pinball game at all.

12 That pinball game is a very complex real time
13 system. In that struc -- well, we have covered it up, but in
14 that matrix, there are 64 switches that have to be scanned and
15 where the closure has to be detected in time to respond, while
16 at the same time keeping all the lamps lit at the appropriate
17 time, the digits going, and the score, doing the calculations
18 in a microprocessor, which in 1974 was absolutely nothing in
19 comparison of power to what was available to a Ford Motor
20 research team in a mini computer, and it had to be done at
21 low cost in an environment where there was a tremendous amount
22 of noise.

23 That was a difficult problem in that year and
24 especially for the typical digital logic designer who would be
25 working in this environment.

1 Remember, the digital logic designers are
2 not pinball experts, and as a consequence, one had to look to
3 this kind of an engineer. He had to learn about pinball
4 games or work with a pinball engineer. He was accustomed to
5 solving all of his problems in hardware, had no concept of
6 this scheme that we are talking about, namely, this coopera-
7 tion between hardware noise prevention and this software
8 noise immunity.

9 That was a foreign concept to the engineers of
10 that era, and they were not accustomed to doing that. Those
11 people had to deduce for this pinball game that with the
12 economic constraints, they could do reasonable and low cost
13 hardware prevention. What they could not do with hardware
14 noise prevention, they had to do in the software to make that
15 pinball machine operable, using the words of the patent.

16 It is my opinion -- I have been working on
17 real time systems since 1960 -- that that is a complex prob-
18 lem and for this industry and the people who were working in
19 it in 1974, '75, that was a feat to produce that design, and
20 the particular design that emerged from this by Frederiksen
21 is what I termed earlier and which I will state again, because
22 I believe it, it is an elegant and lasting design and was a
23 very creative contribution.

1 Q Now technically, all that had to be done -- and you can
2 answer yes or no to this. Put aside the economic constraints.
3 Put those aside. They exist in every industry.

4 We can agree on that, can't we? Ford Motor Company,
5 with all of its resources, nevertheless had to come up with an
6 economic system, did it not?

7 A Not in the sense that you are using the word "economic."

8 Ford Motor's economics come from producing five or
9 six million cars per year and that divides the cost by quite a
10 large number; but I agree with the general statement that all
11 projects, no matter how large or small, have some economic
12 constraints, sir.

13 Q Now, isn't it the fact that in 1973 microcomputers had
14 been installed and in use on any number of real time systems?

15 A In that era I was working very heavily in the process
16 control field, both in a research environment at Case Western
17 Reserve University, the industrial sponsored program, and
18 through consulting, and that industry had been using mini
19 computers with data acquisition systems that were hardware
20 oriented that were extremely expensive, more expensive than
21 the computer by far, to solve the noise problems since
22 computer control was introduced in 1961.

23 At that time it was not considered feasible to use
24 the microprocessor to replace what is called the front end to
25 the computer because of severity of the noise problem. They

1 were not being widely used in all of the industries I talked
2 about. It was only later when the entire structure of
3 process control systems changed to module distributed systems
4 and the modules changed in where they were placed that micro-
5 processors were introduced in the systems that I am familiar
6 with.

7 Q Sir, I ask you once again is it not the fact that in
8 1973, before Mr. Frederiksen completed his work, perhaps even
9 started his work, microprocessors were being used in various
10 industrial applications in real time situations?

11 A I personally do not know of any control product in '73
12 that I would consider a working product that involved a
13 microprocessor that had previously, for example, been done by
14 mini computers. The only exceptions were the industries like
15 the aerospace industry, where there are different constraints
16 and different kinds of people who were probably using micro-
17 processors and were part of the development of the microproc-
18 essor art, sir.

19 Q Sir, you confuse me. Is your answer to my question yes
20 or no?

21 A My answer to your question was I am not aware of an
22 industrial process control product in 1973 that was replacing
23 the corresponding work that had been done up through those
24 years where noise was any kind of a significant problem.

1 Q You are saying --

2 THE COURT: I share Mr. Goldenberg's confusion.
3 I do not know whether you are saying yes or no. I take it
4 you are saying no.

5 THE WITNESS: I think I am saying no.

6 THE COURT: All right. The answer is no.

7 THE WITNESS: There may be some. I just don't
8 know of them.

9 THE COURT: As far as he knows, the answer is no.

10 MR. GOLDENBERG: All right.

11 BY MR. GOLDENBERG:

12 Q Let me show you a document which we have marked as
13 Exhibit 21-A.

14 MR. SCHNAYER: Excuse me, Mr. Goldenberg. I do not
15 think we have a copy of that.

16 MR. GOLDENBERG: I think you do. You were supplied
17 it yesterday. It is the Intel microcomputer, April 1973.

18 MR. SCHNAYER: Your Honor, I would like to make
19 an objection at this point.

20 We received recently a copy of an updated 282
21 notice. If your Honor recalls, under Section 282, defend-
22 ants are required 30 days prior to trial to list the prior
23 art that they are relying on at trial.

24 They, in fact, updated that maybe a couple of
25 times even before the trial in that 30-day period.

1 We received yesterday afternoon a stack of new
2 prior art that they are claiming they are going to be using
3 at the trial. Apparently this is one of them. We have not
4 received a marked copy of an exhibit yet.

5 We have not had a chance to even look at that
6 material, and I object to its use completely at this time.

7 If they are going to rely on further prior art,
8 according to the scope and spirit of Section 282, we would
9 have to be able to go back and have the ability to, if we
10 need to, amend our claims and recall all of our witnesses.

11 This does not give us a proper chance to adequately
12 prepare for trial. This is a statutory requirement which is
13 not being complied with at this time.

14 I have not even gone through all of their docu-
15 ments. I have not had the occasion to. It is a huge stack.

16 THE COURT: Mr. Goldenberg.

17 MR. GOLDENBERG: Your Honor, this is one document
18 from this huge stack, which is not all that huge, to start
19 with. It was supplied to them yesterday with an exhibit
20 tab on it.

21 It is, as you see, a simple brochure. We have
22 made the point earlier in this proceedings numerous times
23 that the microprocessor, at the time that we were talking
24 about, was finding a lot of applications. We were not aware
25 that Dr. Schoeffler or anybody else testifying in this case

1 was going to take the position we believe to be incredible;
2 namely, that that was not the case.

3 THE COURT: Well, you are not relying on this as
4 prior art in the sense that it anticipated the invention?

5 MR. GOLDENBERG: No, sir.

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MR. GOLDENBERG: ... of that? We got it late last night.

BY MR. GOLDENBERG: ... one yesterday. I would like to ask you to go through it, as I have to read it to the jury.

THE COURT: ... Proceed.

BY MR. GOLDENBERG: ...
Q ... is ...
A ...
Q ... that was supplied by the ...
A ... is the ...?

r

1 THE COURT: This is general background information.

2 MR. GOLDENBERG: This is general background infor-
3 mation.

4 THE COURT: It is also information that goes to the
5 question of his expertise --

6 MR. GOLDENBERG: Surely.

7 THE COURT: -- it seems to me.

8 Obviously, this is a person who should have
9 been familiar with everything that has been going on, and
10 whether or not it specifically anticipates the invention in
11 question, the objection is overruled.

12 MR. SCHNAYER: Can we have a copy of that? We got
13 it late last night.

14 MR. GOLDENBERG: We supplied you one yesterday.
15 I invite you to stand beside the witness as he turns through
16 it, as I have to do, because this is all --

17 THE COURT: That will not be necessary. Proceed.

18 MR. GOLDENBERG: Yes.

19 BY MR. GOLDENBERG:

20 Q Dr. Schoeffler, I show you this document, which is
21 Defendants' Exhibit 21-A.

22 Have you read the cover of the document, sir?

23 A I read the title.

24 Q Intel is the company, is it not, that was supplying the
25 microcomputer used by Mr. Frederiksen in the Flicker game?

1 A. That is correct, sir.

2 Q. Is your understanding the same as mine, that whatever
3 he did was done essentially in 1974, is that correct?

4 A. That is my understanding, sir.

5 Q. The date on this publication is April 1973, isn't that
6 correct?

7 A. That is what the cover says, sir.

8 Q. Now, can you agree with me that after turning through
9 that to your satisfaction that that shows in April of 1973,
10 not only the microprocessor, but, very specifically, the
11 Intel microprocessor was being applied, had been applied, in
12 any number of applications?

13 A. The microprocessor, of course, in 1973 -- excuse me --
14 as I testified earlier on direct examination was being used
15 in 1973 in calculators and calculator-like applications.

16 The ones I see here including instrumentation
17 fall into that category, in my opinion.

18 Q. All right, sir.

19 A. So I am looking at this page, which is unnumbered, and
20 a desk top computer and a blood analyzer fall into that
21 category.

22 Q. Let me ask you a question, if I may.

23 A. Yes, sir.

24 Q. Turn to the unnumbered page, which is "Intel Micro-
25 computer Works in Com Star's Control Computer."

Is that a desk top calculator application?

A. I will read the column that is written here.

Q. Sure, read it before you give your answer.

A. Thank you.

THE COURT: Which one is it? Excuse me. calculator application?

THE WITNESS: This one, your Honor, "Com Star

Process Control Computer." According to this column it appears

that this is a digital logic application.

THE COURT: Yes. And it's an industrial process control, is it not?

A. The industrial processes used lots of logic for sequencing things and the like.

And this is, looks like a replacement for, as they indicate here in the middle paragraph, racks of counters, timers and relays.

And in the early 70s that's what the Intel and the other microcomputer vendors were pushing the microprocessors for. That is, take discrete logic out of which we design control systems, and replace it by a program to do the same thing.

And so this is a control application, that is correct, sir.

This is not -- the way I read -- there is very limited information here, of course, and so it would have to be investigated before anything certain could be said -- but this does not fall into the category of what we normally

(Brief interruption)

BY THE WITNESS:

A I've read this, sir.

BY MR. GOLDENBERG:

Q My question, sir: is that a desktop calculator application?

A No, sir. From the wording in this column it appears that this is a replacement digital logic application.

Q And it's an industrial process control, is it not?

A The industrial processes used lots of logic for sequencing things and the like.

And this is, looks like a replacement for, as they indicate here in the middle paragraph, racks of counters, timers and relays.

And in the early 70s that's what the Intel and the other microcomputer vendors were pushing the microprocessors for. That is, take discrete logic out of which we design control systems, and replace it by a program to do the same thing.

And so this is a control application, that is correct, sir.

This is not -- the way I read -- there is very limited information here, of course, and so it would have to be investigated before anything certain could be said -- but this does not fall into the category of what we normally

1 think of as a real time process control computer-based
2 application.

3 In contrast, it is what we would call a digital
4 logic replacement, sir.

5 Q All right, sir. Let's deal with that.

6 Do I misunderstand that this is a bottle loading
7 machine? Right?

8 A Yes, sir.

9 What it says specifically here is, "It tells
10 the machine how to load bottles of different sizes."

11 So I imagine -- and I have to conjecture based on
12 what I had seen at that time -- that when --

13 Q Let me ask you a question, sir: and you say that's
14 not real time?

15 A What I said, sir, was that this kind of an application
16 of the computer does not fall into the category of what we
17 normally term, in those years, to be real time process control
18 kinds of systems where it was doing digital logic.

19 The difference would be primarily, this thing
20 would be sitting there keeping track of time, reading the
21 signals and counting, and periodically outputting a signal
22 to the device.

23 Q And it is indifferent as to whether the bottle it wants
24 to be loaded is under the filling spout or 20 feet down the
25 conveyor line. Is that what you're telling me?

1 A No, sir.

2 I would have to look at the actual implementation
3 of this one to be specific. It could have been organized in
4 a number of ways.

5 It could be that the hardware on the machine is
6 actually carrying out the application, and the computer is
7 calculating the commands.

8 Or, if it were closer to real control like the
9 computer in the car, if it was actually doing the commands
10 on a moment-by-moment basis.

11 There's not enough information there to be defini-
12 tive about how complex it is, how difficult, or things of
13 this nature.

14 That's a calculator. One takes a measurement of some kind
15 and then does a calculation in order to eventually
16 report on or display the contents of the blood. That's an
17 instrumentation kind of application.

18 And it's not like the pinball machine, that is,
19 where it's doing the calculation it's got to do out and it
20 lights and sequence things.

21 And so I just don't use that word to describe it
22 and I don't believe that most people working in the control
23 field in 1973 would call that a real time system.

24 A computer machine has never been and today is still
25 not considered a real time system. I'm referring to the next

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ure, 1 Q I understand, sir.
r.

2 Now in that Intel brochure there are a number of
3 devices which are real time uses of the Intel microprocessor
4 in 1973, are there not?

5 A The desk top calculator or desk top computer I don't put
6 in that category any more than I put a calculator.

7 The word real time, when it was used in this era,
8 all right, always carried the connotation of many things going
9 on in parallel, simultaneity of events we used many times to
10 describe what was going on in there, in a noisy environment.

11 That's not true of the desk top computer. It's
12 probably not true of the blood analyzer.

13 Namely, the way a blood analyzer normally works,
14 just like a calculator: One takes a measurement of some kind
15 and then goes through a calculation in order to eventually
16 print out or display the contents of the blood. That's an
17 instrumentation kind of application.

18 And it is not like the pinball machine, that is,
19 while it's doing the calculation it's got to go out and light
20 lights and sequence things.

21 And so I just don't use that word to describe it.
22 And I don't believe that most people working in the control
23 field in 1973 would call that a real time system.

24 A business machine has never been and today is still
25 not considered a real time system. I'm referring to the next

1 page.

2 Q Can I ask a question, sir?

3 A Yes, sir.

4 Q I'm a business man. Let's take one of these devices here:
5 The desk top computer. Is that real time?

6 A I've just said that I would not call that real time
7 because it would just muddy the use of that word, it would be
8 a vague use of that word, sir.

9 Q And would it be your testimony therefore that someone
10 using a desk top computer can, using the keyboard, punch in
11 some numbers and then what does he do? Go out to lunch and
12 then come back after lunch and see what happened.

13 A That's not the essence of my use of the word real time.

14 Q The essence of the word real time, when you're
15 talking control, is carrying out events with prescribed
16 response times, simultaneity of events, lots of noise.

17 A None of those are present in the desk top computer.
18 That's a low noise environment. There is no hard constraint
19 on the response time.

20 Q In fact, if you punch in some numbers, as you'll
21 describe it, and have it do a calculation, the answer is,
22 you wait for that calculation, whether it does it in a tenth
23 of a second, one second or an hour, you have no choice.

24 A And so people in 1973 and today would not call a
25 desk top computer a real time computer control system, sir.

,2,3

1 Q Do you recognize, sir, that there are some who might dis-
2 agree with you?

3 A I accept that there may be many that would disagree with
4 me, sir.

5 Q All right. Now, let's talk about noise.

6 Can you agree with me that a bottle filling machine
7 associated with conveyors, electric motors, and switches and
8 heavy electrical currents, can you agree with me, sir, that
9 that's a rather noisy electrical environment?

10 A Without seeing that factory, I'm sure that it probably
11 is, sir.

12 Q Much noisier in fact than in a pinball environment, is
13 it not?

14 A Not necessarily, sir.

15 The noise depends on proximity of things. In
16 other words, the noise we were worried about under that play-
17 field in the pinball machine is all constrained in there
18 closely where these things have to be.

19 In the factory, if it was one of these very dense
20 factories with motors and relays and all these things all
21 packed in, it could be horrible, some of them are terrible.
22 They could be separated.

23 The severity in the environment depends on the size
24 of the current, how rapidly things are changing, and the like.

25 If this is an old-fashioned conveyor system, the

1 only electric motor kind of things were the running of those
2 motors, and in general those have not proved to be major
3 sources of problem.

4 Not like the motors you would see on a steel mill
5 rolling line where you're trying to control steel and it's
6 jerking back and forth and you're starting and stopping and
7 there are very large currents going.

8 So without looking at the environment, it's very
9 hard to compare them.

10 But because it's industrial size does not necessar-
11 ily make it any worse or any better than the pinball game.

12

11 13 On this line, the

14 software is

15 what was looking

16 not common

17 time. Just

18 So I

19 hardware

20 in 1973 and

21 equipment,

22 That is

23 So

24 as

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1 Q But there is electrical noise, is there not, sir?

2 A Absolutely I would expect electrical noise, and in the
3 design of the control system, a competent engineer would have
4 to take that into account very, very carefully.

5 Q In 1973 competent electrical engineers knew a whole
6 repertoire of devices to deal with noise, didn't they?

7 A Noise has been a problem forever in electrical engineer-
8 ing, and in 1973 the typical digital logic designer would
9 have been concerned with noise, most especially, however,
10 limited to hardware techniques for eliminating the noise, not
11 software techniques for eliminating the noise.

12 That is where the lack was, and that is what appears
13 in this invention to give this combination of hardware and
14 software cooperating to carry out the application. That is
15 what was lacking. That was not generally available in '73 and
16 not common knowledge, not taught in the schools even at that
17 time, just beginning.

18 Q So I think we are in agreement that with respect to
19 hardware solutions to noise, great numbers of them were known
20 in 1973 and resorted to by digital designers as they designed
21 equipment, isn't that correct?

22 A That is correct, sir.

23 Q So that what we are left with are the software solutions
24 to noise as being somewhat unique on the part of Mr.
25 Frederiksen, is that correct?

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1 A Oh, no, that is not correct, sir. I did not testify to
2 that at all.

3 What I said was it was the combination of hardware
4 and software that was so unique in the invention.

5 Q The combination, all right, sir.

6 Well, I am not going to go through all that again,
7 but just tell me as quickly as you can the software solutions
8 to noise. Lag sensing I recall was one of them.

9 A You want --

10 THE COURT: We don't want to repeat --

11 MR. GOLDENBERG: No, no, no.

12 THE COURT: I recall we spent days --

13 MR. GOLDENBERG: I will withdraw that, Judge. I
14 will withdraw that.

15 BY MR. GOLDENBERG:

16 Q All right, sir, there is one thing. Do you have a copy
17 of the patent up there, the '441 patent?

18 A Yes, sir, I do.

19 Q Can you point out to me anywhere in the patent where
20 software noise techniques are discussed?

21 A In the computer program, sir, that is part of the patent.

22 Q In the computer program?

23 A Recall that in all the claims and in the specification,
24 it refers to microprocessors, programs, program memory, use
25 of sub-routines, and all of the other things associated with

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1 programs to make it operable.

2 A That "means plus function" language, when we look
3 into the specification, we find noise, real time all over the
4 place, and in the specific ones disclosed by Frederiksen, as
5 used in the Flicker, those specific ones happen to be in the
6 computer program.

7 Q Can you point out to me in the English text of the patent
8 where software noise solution techniques are discussed?

9 A In the computer program, which is part of the patent, in
10 English, in comments, there are several, and I will read them
11 to you, sir.

12 On the first page of the program, inside the sub-
13 routine that is labelled "Switch," you see the English state-
14 ment, "Ignore the noisy switch."

itch. 1 Q All right, sir, perhaps we can shorten this.

2 A All right.

3 Q I understand it is your position that in the program
4 listing there are a number of things which deal with soft-
5 ware solution to noise, is that correct?

6 A That are displayed both in the listing and the comments
7 that go with the listing, sir.

8 Q Now I direct your attention to column 3, line 21 of
9 the patent.

10 MR. LYNCH: May it please the Court, your Honor
11 (indicating).

12 THE COURT: Oh, fine. Thank you. I have it
13 somewhere here.

14 Line 3?

15 MR. GOLDENBERG: Line 21.

16 THE COURT: Column what?

17 MR. GOLDENBERG: Line 21, column 3.

18 BY MR. GOLDENBERG:

19 Q Can you read, sir, out loud the paragraph starting on
20 that line?

21 A You are asking me to read it out loud, sir?

22 Q Yes, sir, I am.

23 A "The invention thus provides a convenient means for
24 maintaining a generalized logical control for a game
25 apparatus, employing the advantages of a small memory

1 system which can, of course, be readily adapted to a
2 conventional software control of the game response, in
3 accordance with a relatively fixed field memory."

4 Q Is it unreasonable, sir, to conclude from that that
5 the software that Mr. Frederiksen is talking about there
6 is conventional?

7 A No, sir, I don't believe that is the use of the word
8 conventional there.

9 I believe I would interpret that use of the word
10 conventional there not to mean the particular program or
11 organization that he had, but conventional in that software
12 running in computers can control and manipulate information,
13 and it is equivalent to saying that it is well known that
14 software can do it.

15 I do not believe he is referring to his own program
16 at that point.

17 THE COURT: In your view Frederiksen's program was
18 definitely not conventional?

19 THE WITNESS: That is correct, sir. The organiza-
20 tion of that program had to be such that it could work
21 just properly with the hardware to do it, and none of the
22 programs we saw, for example, in the 4004 microprocessor
23 manual or anything like that, taught any such structure for
24 real time programs.

1 BY MR. GOLDENBERG:

2 Q Now, sir, were you in Court when Mr. Frederiksen testi-
3 fied that this large drawing here, Exhibit 13-E, was an
4 accurate representation of the system of the '441 patent?

5 A I do not believe I was present that day, but I read his
6 testimony, sir.

7 Q Do you have a view as to whether or not that is an
8 accurate representation of the system?

9 Let me change the word here.

10 Have you ever heard the word, architecture,
11 in connection with digital logic and computer system?

12 A Yes, sir.

13 Q Would you accept the characterization of this as repre-
14 senting the architecture of the '441 patent?

15 A The word, architecture, when it is used in conjunction
16 with the applications like this or computer systems is
17 referring to the organization of the systems, and it is usual-
18 ly displayed much the way this diagram is displayed, as a
19 block diagram. But it is always qualified as to the purpose
20 for drawing the block diagram; namely, the purpose of a block
21 diagram is to give insight into a complicated system to some
22 aspect of it under discussion.

23 So, for example, if what you are concerned
24 about in the discussion of the Flicker is the way these
25 columns are synchronized in time and that line there then that

1 comes out from the block labeled memory and then goes up to
2 the 1-of-16 decoder and down to the 1-of-16 decoder and so on,
3 that kind of consideration; then that can be discussed and
4 given insight into that. And in that sense, this is --

5 This is accurate. I did not see the one line
6 there, for that aspect of it.

7 Where it is not an accurate representation of
8 the system is if we were discussing things like noise preven-
9 tion and noise immunity, the organization or structure of the
10 real time system. There the block diagram does not help or
11 give insight into that aspect.

12 Q Because it does not have the circuit details that you
13 would talk about in connection with that kind of thing?

14 A Those things are not just circuit details. The noise
15 prevention and noise immunity combination is what makes the
16 patent work.

17 Q Sir, --

18 A And if I were discussing that, this would be worthless.

19 Q Sir, I meant nothing derogatory by calling them details.
20 I truly did not.

21 Those are circuit, specific circuit elements.
22 They are not shown in this drawing. Isn't that what you are
23 telling me?

24 A They are not shown, nor is there interaction with the
25 software in order to make this thing work properly shown on

1 that diagram, sir. The basic structure?

2 A It shows it so it is inadequate for that point of view.

3 That is all I am saying. The lamps, the dice, and the displays,

12-4 is that the -- some of the other things, as I said, would be
5 possible, sir. That is correct.

6 Q All right, sir.

7 Now, can you move back on the right-hand side of
8 this drawing, not the lower half of the right-hand side, we
9 show the single matrix shown in the A-1 patent, is that
10 correct?

11 A I would interpret that as representing that, yes, sir.

12 Q The lamps, the dice, and the numeric displays all
13 connected into the single matrix?

14 A That is correct, sir.

15 Q Can you turn to the patent to confirm it?

16 A I have found column 2, sir.

17 Q Now, I ask you, sir, in reading -- if you start in
18 column 2 at line 41 and continue down to line 48, let me ask
19 you to read the

20 A Starting with the word, "generally,"

21 Q "generally," and then read down to the line 48.
22 Read that out loud, sir.

23 A "Generally, in accordance with the present inven-
24 tion, the playing field is constructed in accord-
25 ance with the usual construction to develop a

yng--

1 Q But it shows the basic system architecture?

2 A It shows the matrix and, most importantly, it shows
3 the synchronization of the lamps, switches, and decoders,
4 so that the -- some of the noise immunity techniques would be
5 possible, sir. That is correct.

6 Q All right, sir.

7 Now, can you agree that on the right-hand side of
8 this drawing and the lower half of the right-hand side, we
9 show the single matrix shown in the '441 patent, is that
10 correct?

11 A I would interpret that as representing that, yes, sir.

12 Q The lamps, the switches, and the numeric displays all
13 connected into the single matrix?

14 A That is correct, sir.

15 Q Can you turn to the patent in Column 2?

16 A I have found Column 2, sir.

17 Q Now, I ask you, sir, in reading -- if you start in
18 Column 2 at line 43 and continue down to line 48, let me ask
19 you to read that.

20 A Starting with the word, "generally"?

21 Q "Generally," and then read down to the line 48.
22 Read that out loud, sir.

23 A "Generally, in accordance with the present inven-
24 tion, the playing field is constructed in accord-
25 ance with the usual construction to develop a

1 plurality of lanes, response target devices, and
2 flipper elements. The several elements activate
3 switch means and establish signals to a common
4 matrixing or multiplexing circuit."

5 Q Now, doesn't that say, sir, that in accordance with the
6 invention of the '441 patent, there is a common matrix circuit
7 for those elements?

8 A That particular statement does, but earlier in Column
9 2 is a previous reference, which does not preclude the
10 multiple matrices, and it is evident from the claims later on
11 that the meaning of those was to claim the multiple matrices.

1 Q What earlier statement do you have reference to, sir?

2 A I will have to find it, sir. Excuse me.

3 (Brief interruption)

4 BY THE WITNESS:

5 A It is the section that begins at line 25.

6 BY MR. GOLDENBERG:

7 Q Is this in Column 2 also?

8 A It's also in Column 2, which is previous to the section
9 you asked me to read.

10 And there it says:

11 "Generally in accordance with the present inven-
12 tion the display means, the element activated the
13 response means, and the interlocking control means
14 are arranged into sequentially activated element
15 groups and connected through a matrixing or multi-
16 plexing means to a program logic means such as a
17 microprocessor," et cetera.

18 It does not say that those had to be in a common
19 matrix, and clearly describes the situation where the micro-
20 processors were controlling several matrices, either with
21 switches in one, lamps in another and digits in another,
22 or some other combination. It is not excluded there.

23 The specific embodiment which is then described
24 at length in the patent clearly and consistently is refer-
25 ring to the single matrix as in Flicker.

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1 Q And you don't see that paragraph in Column 2, "Summary
2 of the present invention," as getting from the broad to the
3 more specific as the inventor describes his invention in
4 greater detail?

5 A I'm afraid your question is not clear to me, sir.

6 Q Let me withdraw it, then.

7 Isn't it a fair reading of that paragraph to
8 simply appreciate that what's being done there, that the
9 inventor, after making some general statement, is simply,
10 as he progresses through the paragraph, is now telling you
11 more specifically as you get toward the bottom of the
12 paragraph as to what his invention is?

13 And he finally tells you, he finally tells you that
14 the invention is putting these elements in a common matrix.

15 A I don't agree with that, sir.

16 Q Okay.

17 A I read this as being what he's -- most of this patent,
18 where he says, "Let's get down to the specific embodiment,"
19 over and over again.

20 But I believe that this is part of the specifica-
21 tion, and this is totally consistent with the claims which
22 lead to the multiple matrices, sir.

23 Q Can you agree with me, sir, that in Column 2 in the
24 part from which you just read, in line 28, it talks about
25 a matrixing means, doesn't it?

1 A Yes, but when one talks about a matrixing means, this
2 is a means to carry out a function. And so separate matrices
3 are ways to carry out those functions, and they are
4 described then throughout the patent.

5 So when you just read it all, I think it becomes
6 very clear precisely what is meant here, sir.

7 Q All right, sir.

8 MR. SCHNAYER: Excuse me, Mr. Goldenberg. What
9 number is that?

10 MR. GOLDENBERG: 11-F.

11 MR. SCHNAYER: Thank you, sir.

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1 BY MR. GOLDENBERG:

2 Q The large drawing is Exhibit 11-F. And do you have a
3 copy of Defendants' Exhibit 1-L?

4 A This is the one -- 1-L is the electronics article, sir?

5 Q Yes, sir.

6 A I may have.

7 I have one, sir.

8 Q If you'd turn to Page 88.

9 A Yes, sir.

10 Q Can you agree with me, sir, that this large Exhibit 11-F
11 is really nothing more than the blowup of the system shown on
12 Page 88 of Exhibit 1-L, with the omission that a synchronizing
13 line at the bottom of the drawing is omitted and a control A
14 and a control B lines are omitted?

15 A That, plus the indications here that the data buses are
16 8 bits and the address buses are 16, that is essentially
17 the same diagrams, sir, and the frequency of the clock.

18 Q Now, let's go to Exhibit 13-E here.

19 A Can we agree, sir, that the way the '441 patent
20 works, the processor, acting through the memory, strobes or
21 scans each one of these lines, these vertical lines in
22 succession as a result of the operation of the 1-of-16 decoder?

23 A That is such a gross oversimplification that it really
24 does not describe what is going on in the invention, which is
25 displayed on this particular diagram.

2
1 Q All right, sir. Then you tell me, you tell me how the
2 microprocessor acts through the decoder on this single matrix
3 that we see in the drawing?

4 A Yes, sir.

5 The heart of this block diagram, and I assume the
6 purpose that it was created for, is to illustrate how the
7 matrix multiplexing hardware and then the software program
8 that controls it works together; and these strobes here then
9 become very essential to that, because the way this works is,
10 we need to have the lamps and digits on for one millisecond,
11 and then we move to the next column --

12 Q Dr. Schoeffler --

13 MR. SCHNAYER: Excuse me, your Honor, I object.
14 He's cutting his answer off.

15 BY MR. GOLDENBERG:

16 Q -- we have been all through that time and time again.

17 And all I want to do is to tell me how that system
18 is strobed. Would you do that, sir?

19 A Yes, sir.

20 The sequence is as follows: Under microprocessor
21 control, taking data from the memory, while a given column
22 is active, given column is being displayed, one loads up in
23 advance of the strobing the value for the lamps, that is, the
24 on-off status of the lamps for the next column, but do not
25 turn them on -- does not turn them on;

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1 Sets up the value for the digits for the next
2 column, but does not turn it on, all right;
3 Selects the next column, and then simultaneously
4 strobes these. And so there is an abrupt switch to the next
5 column simultaneously to yield the noise prevention through
6 those transistors which are not shown here, to do the strobing.

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Schoeffler - cross

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1 Q Dr. Schoeffler, I would like an answer to my question.

2 A I am sorry, sir; I thought I did.

3 Q I don't believe you did, sir.

4 A Can we agree that that strobing is sequentially,
5 cyclically across the 16 lines; that prior to the strobing
6 from one column to the next, the lamps have been set up and
7 the segment drives have been set up, isn't that correct?

8 A Oh, yes, I didn't add that it was cyclical and sequen-
9 tial, yes, sir.

10 Q The system just does that over and over again, doesn't
11 it? When are they read?

12 A Yes, sir.

13 Q When this first column is strobed --and what do we mean
14 by strobing? What does that mean? the switches --

15 A The word strobe --

16 Q Keep it short, sir.

17 A Okay. (Continuing) -- simply means after, as you have
18 described it, setting up these two, suddenly turning them on,
19 it is an abrupt signal that comes out.

20 Q So this column is enabled; is that a fair way to put it?

21 A That is correct.

22 Q All right, sir.

23 A Suddenly.

24 Q So this lamp, any lamp that has been set up in this
25 column, will come on, any segment drive or segment that has

1 been set up in this column will come on and at the same time
2 any switches in this column will be sensed to see if any one
3 of them is closed, is that correct?

4 A The last phrase is not correct. The enabling does turn
5 on the lamps and the digits, and it enables the column in
6 which the switches are in to be read when and if you wish
7 them.

8 They are definitely not read at that point in time
9 when this is strobed because that would be the high noise
10 time.

11 Q When are they read?

12 A They are read, as Frederiksen described, offset in time
13 after the --

14 Q Lamps have been turned on and the switches --

15 A And signals have died down.

16 Q But that is a very short period of time, is it not?

17 A You are asking for a rather specific number for that, sir,
18 or -- all things that are going into the microprocessor are
19 short --

20 Q All right, sir.

21 A -- but compared to the other times, I don't know that I
22 would call it short or long.

23 Those are awkward words there to describe it.

24 Q All right. Perhaps that is not a good word.

25 Then under the computer control, it then goes over

1 to the next column, where that is done again, isn't that
2 correct?

3 A. That is correct, sir.

4 Q. All right, sir, I read to you from the patent, column
5 3, line 45:

6 "Processing will further include a step command
7 signal to simultaneously activate the multiplexing de-
8 coder..."

9 and this is the multiplexing decoder right here (indicating),
10 isn't it?

11 A. That is correct, sir.

12 Q. "...or sequencing system and simultaneously control
13 the interfacing drive to the display means..."

14 Now, the display means are either the lamps or the
15 numeric display.

16 "...to maintain precise synchronous relationship."

17 A. Yes, sir.

18 Q. Isn't that what the patent says?

19 A. That is what those words say in those lines, yes, sir.

20 Q. Now, do you consider, sir, a system having the archi-
21 tecture shown in Exhibit 11-F -- and let's substitute lamps for
22 a printer and let's put solenoids over here and let's say
23 these are playfield switches instead of keyboard switches.

24 Do you consider that system to be an infringement
25 of the '441 patent?

1 And let's put it in a pinball game. I am sorry.

2 Let's take this system architecture, make these
3 playfield switches, make these lamps, and make these solenoids,
4 and put it in a pinball game.

5 Is that an infringement of the '441 patent?

6 A In order to discuss infringement, it should be done on
7 a specific machine. That rough architecture you just
8 described is similar to what is done in the Williams game, and
9 I have already testified that yes, indeed, the claims read on
10 those games, sir.

11 I am drawing I say
12 the rough one, and I am not going to go into the details of the claims on
13 it and look for any infringement.

14 Q All right, sir, is that all?

15 A But if you take that rough one to be a representation of the
16 Williams game, then I think it is a fair representation of the archi-
17 tecture does not include the separate
18 matrices drive. That is a separate thing as you have
19 displayed there, and I can agree with that.

20 Q I haven't displayed it to be accurate, sir. My question
21 to you is that if I take this system architecture and these
22 now become playfield switches, and I have lamps, and I have solenoids and
23 put it in a pinball game, have I infringed the '441 patent?
24 A What I have to do, sir, is I have to look at that
25 pinball game and see what it is doing, including

1 Q Can you agree with me, sir, that this system architec-
2 ture of Exhibit 11-F is different from the architecture of
3 13-E?

4 A Yes, sir, I can agree with you that it is different
5 architecture when architecture refers to the key attributes
6 you are talking about, namely, the separation of the
7 matrices into multiple matrices, sir.

8 Q So in order to have infringement, these game playfield
9 switches, these game lamps --

10 A I do not agree, sir, that what you are drawing I say
11 infringes the machine. In order to say something infringes
12 the machine, one has to be careful and read the claims on
13 it and look for all aspects of the invention.

14 Q All right, sir, let's --

15 A But if you interpret that to be a representation of the
16 Williams games, then I think it is fair, and that archi-
17 tecture does use that Motorola 6800 and does have separate
18 matrices driven from the PIA input/output chips as you have
19 displayed there, sir. So I can agree with that.

20 Q I haven't interpreted it to be anything, sir. My question
21 to you is that if I take this system architecture and these
22 now become playfield switches and instead of a printer here, I
23 have lamps, and I let this PIA over here drive solenoids and
24 put it in a pinball game, have I infringed the '441 patent?

25 A What I have to answer, sir, is I have to look at that
pinball game and the way that is done precisely, including

1 how you do this combination of hardware noise prevention,
2 that is, what noise problems you solve in the hardware and
3 then which ones you solve in the software, because that is
4 the way the claims are written and all of the elements must
5 be present in order for me to say that the claims are read.

6 I was able to do that on the Williams game. This
7 is too oversimplified to allow me to do that.

8 Q Well, let me make one further assumption. Let me
9 assume that I have put into this system noise suppression
10 devices. Do I infringe then?

11 A When we go through that claim, such as 45, it is the
12 combination of the noise prevention and the noise immunity.
13 So you have to tell me how the software is organized and how
14 all of this is run.

15 There are lots of details before we can make a
16 definitive statement like Claim 45 reads on it. That is
17 too oversimplified for me to do that, sir.

18 Q I am assuming, sir -- I will write it on there. I will
19 write it.

20 A I am not trying to avoid your question, sir. It is
21 just that--

22 Q I am just going to write down here --

23 A -- I can't answer it.

24 Q -- "plus noise suppression."

25 Is there infringement?

1 A Are you presupposing, sir, that we have matrix multi-
 2 plexing of the switches and some of the displays, that it
 3 is operative, that we have a combination of hardware noise
 4 prevention and software noise -- the things that I read in
 5 the claims? If you are assuming all of that, I can answer
 6 the question.

7 Q All that is in Claim 4?

8 A Yes, sir.

9 Q It is not in the full disclosure, is it?

10 A If you read Claim 4, sir, it says "the system of claim 1
 11 that the patent also teaches, and the system of claim 2
 12 not in Claim 45, but the system of claim 45, the system of
 13 function language and is not in Claim 45, the system of claim 45,

14 (Brief interruption.)

15 BY MR. GOLDBERG:

16 Q Assume that it used to be a system of claim 45, that
 17 that fully used is the system of claim 45, the system of claim 45,
 18 would there be any other system of claim 45, the system of claim 45,

19 A The only other system of claim 45, the system of claim 45,
 20 grounding. There were no other systems of claim 45, the system of claim 45,
 21 no circuits, right.

22 Q That is, the system of claim 45, the system of claim 45,
 23 on that drawing.

24 A I am assuming.

25 A That is, the system of claim 45, the system of claim 45,

15-1b1

Schoeffler - cross

1 Q The drawing shows matrix multiplexing, doesn't it?

2 A But the drawing does not show how the software is
3 running this game, how they are related, one to the other.

4 It does not show, for example, whether you
5 might at a certain time be reading the switches in a low noise
6 environment. These are key things in Claim 45.

19-2 7 Q All that is in Claim 45?

8 A Yes, sir.

9 Q It is not in the English words of Claim 45, is it?

10 A If you read Claim 45 and look for the specific words
11 that the patent uses there, the specific words like noise are
12 not in Claim 45, but they are present in the means plus
13 function language and throughout the specification, sir.

14 (Brief interruption.)

15 BY MR. GOLDBERG:

16 Q Assume that it used the noise-suppression techniques
17 that Bally used in its manual that Mr. Lynch asked you about.
18 Would there be infringement then?

19 A The only ones Mr. Lynch asked me about were shielding,
20 grounding. There were four. I cannot even remember -- oh,
21 RC circuits, right.

22 That is insufficient detail to read Claim 45
23 on that drawing.

24 Q I am sorry?

25 A That is insufficient additional information to read

1 Claim 45 on that diagram.

5-2 2 Q Dr. Schoeffler, I am aware that you have been asked this
3 question several times. However, I must ask it again.

4 A Yes, sir.

5 Q What is the invention of the '441 patent?

6 A When I read Claim 45, which defines the invention of
7 this patent, what I read is means plus function language,
8 which I interpret by reading the specification carefully,
9 looking into the figures in the specification, and reading
10 the program carefully. What I find is that Claim 45 calls
11 for a microprocessor-controlled pinball game with operative
12 matrix multiplexing.

13 Now, by the word, operative, I mean that there
14 is a satisfactory combination, a proper combination, of hard-
15 ware noise prevention techniques, whatever they are, and
16 software implemented noise immunity techniques, so that that
17 game operates properly in the intended environment of a pin-
18 ball game, which is a noisy environment in a practical way,
19 giving real time response that is adequate and practical and
20 with a practical level of error recovery, so that the game
21 can be used.

22 That is what I read the invention in in
23 Claim -- is in Claim 45.

24 Q All right, sir, do you know what the noise prevention
25 techniques are in the Williams Disco Fever?

Schoeffler - cross

1923.

Let me withdraw that question.

Can we have the game opened, front and back,
please?

MR. SCHNAYER: Give me one second, please.

(Brief interruption.)

THE COURT: I think before we get into another
game there, this might be a good time to break for lunch.

We will resume at 2:00 o'clock.

(Whereupon a recess was taken herein to 2:00 p.m. of
the same day, Thursday, March 15, 1984.)

1 BALLY MANUFACTURING CORPORATION,
2 A Delaware corporation,

3 Plaintiff/Counterdefendant,

4 vs.

5 D. GOTTLIEB & CO., a corporation,
6 WILLIAMS ELECTRONICS, INC., a
7 corporation, and ROCKWELL INTERNATIONAL
8 CORPORATION,

9 Defendants/Counterplaintiffs.

) Docket No.
) 78 C 2246

) Chicago, Illinois
) March 15, 1984
) 2:15 p.m.

10 VOLUME XIV-B
11 TRANSCRIPT OF PROCEEDINGS
12 BEFORE THE HONORABLE JOHN F. GRADY

13 TRANSCRIPT ORDERED BY: MR. JEROLD B. SCHNAYER
14 MR. MELVIN M. GOLDENBERG

15 APPEARANCES:

16 For the Plaintiff/
17 Counterdefendant:

MR. KATZ

MR. SCHNAYER

MR. TONE

MR. MATHIAS

MS. SIGEL

18 For the Defendants/
19 Counterplaintiffs:

MR. LYNCH

MR. HARDING

MR. GOLDENBERG

MR. ELLIOTT

MR. RIFKIN

MR. GOTTLIEB

20 Court Reporter:

LAURA M. BRENNAN

21 219 South Dearborn Street, Room 1918
22 Chicago, Illinois 60604

THE CLERK: Case on trial.

JAMES SCHOEFFLER, PLAINTIFF'S WITNESS, PREVIOUSLY SWORN

CROSS EXAMINATION (Continued)

BY MR. GOLDENBERG:

Q Dr. Schoeffler, before we adjourned for the noon hour, I did ask you a question; and I have a portion of the transcript here, and upon reading it I'm not sure that you answered my question.

That this Exhibit 11-F from the Electronics article of 1974, that does show matrix multiplexing, does it not?

A That shows a matrix keyboard explicitly on the diagram, and -- and so I guess I would answer that question, yes, it shows a matrix multiplex keyboard.

Q Can you tell us what a PIA is? I see three of them in this drawing.

A Yes, sir. The letters PIA stand for peripheral interface adapter. This is a standard chip that is supplied by Motorola, intended to be used in conjunction with the Motorola 6800 processor.

It connects to the bus that is shown on that exhibit, namely the data and address bus, for the purpose of transferring data from the microprocessor out to devices that might be attached to it, or inputting data from devices into the microprocessor circuitry, sir.

Schoeffler - cross

1 Q So in the case of a printer, the input would be the
2 keyboard, any one of the keys that's hit; and the processor
3 would -- and that would be inputted through the topmost PIA;
4 and then, depending on which key is hit, the printer would
5 respond and, say, if the letter A was hit on the keyboard,
6 the printer would print the letter A. Is that correct?

7 A That would be an example of a function that you could
8 carry out under program control, sir.

9 Q Now, they are general purpose devices supplied by
10 Motorola for whatever applications and purposes engineers can
11 find for them. Isn't that right?

12 A Yes, sir, that is correct.

13 Q Now, still with reference to this exhibit, in response
14 to a question from me -- and let me give you a copy of that.
15 We have that transcript of this morning.

16 (Handing document.)

17 It's at page 1922. In response to my question
18 about what is the invention of the '441 patent, you said this,
19 and I start at line 13:

20 "Now, by the word, operative, I mean that
21 there is a satisfactory combination, a proper
22 combination, of hardware noise prevention tech-
23 niques, whatever they are, and software implemented
24 noise immunity techniques, so that that game
25 operates properly in the intended environment of a

pinball game, which is a noisy environment in a practical way, giving real time response that is adequate and practical and with a practical level of error recovery, so that the game can be used."

Is that your position as to what the invention of the patent is?

A. I was not quite complete in that, and so there are a couple of phrases I would add to that, sir, if I may.

Q. What would you add to it, sir?

A. I referred to Claim 45. And I did not indicate there that it requires matrix multiplexing of switches and some displays, either digits or lamps. I left out that phrase inadvertently.

And what I did not say in my explanation from lines 13 to 21 is that -- that the patent discloses a proper combination of hardware noise prevention techniques and software implemented noise immunity techniques.

And that I have to find a combination of hardware noise prevention techniques and software noise immunity techniques in the infringing machine on which I'm reading the claim.

And if I find such a combination, then that's carrying out substantially the same function as disclosed in the patent, substantially the same way, with substantially the same results.

1928

Schoeffler - cross

Q But aside from that, this is my understanding
of the invention, sir, as claimed in claim 45.

A Yes, that's correct.

Q Now, the invention is claimed to be a method of

displaying data on a screen, is that correct?

A Yes, that's correct.

Q And the data is displayed in a grid, is that correct?

A Yes, that's correct.

Q And the grid is divided into cells, is that correct?

A Yes, that's correct.

Q And the cells are arranged in rows and columns, is that correct?

A Yes, that's correct.

Q And the data is displayed in the cells, is that correct?

A Yes, that's correct.

Q And the data is displayed in a grid, is that correct?

A Yes, that's correct.

Q And the grid is divided into cells, is that correct?

A Yes, that's correct.

Q And the cells are arranged in rows and columns, is that correct?

A Yes, that's correct.

Q And the data is displayed in the cells, is that correct?

A Yes, that's correct.

Q And the data is displayed in a grid, is that correct?

A Yes, that's correct.

Q And the grid is divided into cells, is that correct?

1 Q Is it your testimony then -- and tell me if I misunder-
2 stood you -- that you cannot tell what the invention is until
3 you study the patent, claims, disclosure, what you will, in
4 conjunction with some accused device?

5 A No, that is not correct, sir.

6 In our discussion of this diagram, I indicated that
7 I could not give you an answer whether an architecture -- I
8 believe that was the word you used -- would be infringing
9 without enough detail so that I could read the claim on it.

10 I just gave you a definition of the invention,
11 which is independent of any one particular specific machine
12 upon which we might read the claim.

13 Q Perhaps I misunderstood you.

14 Now I gather, however, it is still your position --
15 that if there is this matrix multiplexing of switches and
16 some displays and it is operative -- and by operative you mean
17 a proper combination of hardware noise prevention techniques,
18 whatever they are, and software implemented noise immunity
19 techniques so that the game operates properly, et cetera --
20 you stand by that?

21 A Yes, sir, the requirement, of course, since it is means,
22 plus function language, is that it be what is disclosed or
23 the equivalent thereof, and it is equivalent if I find in the
24 other machine the combination of hardware noise prevention
25 techniques, any specific ones, working closely together with

2
1 software noise immunity techniques to solve the noise problems.

2 This is what Frederiksen disclosed in the specifica-
3 tion.

4 Q You would consider such a thing to be an infringement of
5 the patent, is that correct?

6 A If all of those elements are present on the machine of
7 Claim 45, I would say it infringes Claim 45, sir, yes, sir.

8 THE COURT: If ten years from now someone devises
9 some hardware or some software or both to suppress noise and
10 those devices were never even dreamt of in 1984, let alone in
11 1973, and that person then builds a Flipper 2 using matrix
12 multiplexing and all the other elements that you have said
13 are necessary, but has totally novel hardware and software
14 which successfully suppresses noise, would that be infringe-
15 ment?

16 THE WITNESS: It is my understanding of this claim that
17 if there is novel hardware which eliminates noise, then that
18 game would have no combination of hardware and software that
19 solved the noise problem. It would not infringe, or if --

20 THE COURT: Excuse me. I don't understand that.

21 THE WITNESS: If 10 years from now someone figures out a
22 piece of hardware, invents a piece of hardware that makes all
23 the noise go away --

24 THE COURT: Makes everything else obsolete.

25 THE WITNESS: Well, all noise go away, electrostatic

1 noise doesn't bother you, switches don't bounce, all of these
2 problems, and it is totally in hardware, then this would not
3 infringe this invention.

4 THE COURT: No, I wanted you to assume that it would be
5 a combination of hardware and software.

6 THE WITNESS: If it is a combination of hardware and
7 software that work together to eliminate the noise, I don't
8 know the nuances of the law about radical new invention, but
9 if it is hardware and software that work together to eliminate
10 the noise, that would infringe Claim 45.

11 THE COURT: So Frederiksen has really cornered the market
12 on any hardware and software which in combination is effective
13 to prevent noise?

14 THE WITNESS: And the key is that it has to work
15 together. The one or the other by itself cannot do it, and
16 that was what was lacking in the digital logic industry at
17 that time and what made this such a breakthrough and an
18 effective device, that is correct, sir. That is my
19 interpretation of Claim 45.

20 THE COURT: But if our hypothetical person does it by
21 hardware alone or by software alone, then he is not
22 infringing?

23 THE WITNESS: That is correct, sir.

24 BY MR. GOLDENBERG:

25 Q All right, sir, let's go to the Williams circuits.

1 BY MR. SCHEFFLER: Dr. Schoeffler, I have now put in front of you
2 Exhibit 11-D, and I ask you to look at it for a few moments
3 and I will have some questions about it.

4 A. I have looked at it, sir.

5 Q. All right, sir, let me look at it for a minute.

6 (Brief interruption.)

7 Q. Put aside the question of global issues. Can you agree
8 with me that this international does show, basically, matrix
9 multiplexing in the sense of the way the displays
10 would you like to have the original in front of you
11 before you answer?

12 A. Before I answer that, let me re-read this, please.

13 (Brief interruption.)

14 BY MR. SCHEFFLER:

15 Q. This next page, please.

16 A. I was going to say that page has no reference at all
17 to display, sir.

18 Q. The next page is page 2, and I draw your attention to
19 the last paragraph.

20 A. Yes, sir.

21 In answer to your question, sir, no, sir, I do
22 not agree.

23 I am looking at the display on the last paragraph
24 where it is stated that the program does not
25 external hardware. It is a self-contained program --

1935

1 BY MR. GOLDENBERG:

2 Q Dr. Schoeffler, before I go on to the Williams circuit,
3 I show you once again this exhibit 1-A, which is a page from
4 the Intel manual.

5 Do you recall that, sir?

6 A Yes, sir.

7 Q Put aside the question of pinball games. Can you agree
8 with me that this Intel manual does show, describe, matrix
9 multiplexing in the same matrix of switches and some displays?

10 Would you like to have the original in front of you
11 before you answer?

12 A Before I answer that, let me re-read this, please.

13 (Brief interruption)

14 BY MR. GOLDENBERG:

15 Q This next page, 52 --

16 A I was going to say this page has no reference at all
17 to display, sir.

18 Q The next page is page 53, and I direct your attention to
19 the last paragraph.

20 A Yes, sir.

21 In answer to your question, sir, no, sir, I do
22 not agree.

23 I interpret the discussion in the last paragraph
24 where Intel is referring to savings and program space and
25 external hardware can be achieved by combining --

1934

1 Q Perhaps if you were to read it out loud, sir, and I
2 would ask you to do that to complete your answer.

3 A Yes, sir.

4 "In systems which combine a numeric display and a
5 keyboard, considerable savings in program memory
6 space and external hardware can be achieved by
7 combining the display scan and keyboard scan.

8 The same loop control and output port logic can be
9 used for keyboard column selection and numeral
10 digit position selection."

11 Q All right, sir.

12 A I would have -- I would answer that the paragraph does
13 allude to combinations of hardware since it is referring to
14 a savings in external hardware, not very explicit, but it
15 does allude to that combination, yes, sir.

16 Q So, in other words, I think you are in agreement with
17 me that the Intel manual, February 1973, does show switches
18 and numeric displays in the same matrix?

19 A No, sir. I am not entirely in agreement with you.

20 It does not show how they are interconnected. It
21 merely indicates that it may be possible to achieve a hard-
22 ware savings. It does not teach how to achieve the hardware
23 savings.

24 A It is.

25 Q Thank you.

1 Q Well, it says that you can combine them in the same scan
2 does it not?

3 A Yes, indeed it does say that, sir.

4 Q All right.

5 A I'd have to explain that.

6 That can be interpreted as the logic in the
7 software for generating it, for example, this section of the
8 Intel manual is, in my opinion, directed toward the calcula-
9 tor. And so by using that same software routine to cyclically
10 and sequentially scan the keyboard array until you detect a
11 closed switch, do your calculation, and then at a later time
12 display the result, is an equally valid interpretation and
13 probably more likely with the calculator orientation.

14 Q Well, don't you save -- by putting them in the same
15 matrix and combining them in the same scan, as the article
16 says, isn't that how you save hardware?

17 A If they are in the -- yes, sir, if they are in the same
18 matrix you save lines and perhaps drivers in the columns,
19 that is correct, sir.

20 And that is indicated by Frederiksen in the
21 patent when he discusses the combined matrix.

22 Q And that's indicated in the article that says this is
23 a hardware saving technique, isn't it?

24 A It is.

25 Q Thank you.

1 All right, sir. I asked you a few moments
2 ago about Exhibit 11-D. Have you had a chance to look at
3 that a bit?

4 A I did, sir.

5 Q Can you agree with me, sir, that that is a fair repre-
6 sentation of the architecture of the Williams solid state
7 pinball games?

8 A No, sir, I would not agree with you on that.

9 Q All right, sir. How would you disagree?

10 A I would agree that this shows the way the Motorola
11 microprocessor chip set is interconnected in the Williams
12 games, namely, connecting to the bus in the standard fashion.

13 But totally missing from this, which would
14 really describe the way Williams builds the pinball games,
15 is all of the hardware related to the switch matrix, the lamp
16 matrix, displays, and the solenoids on the one hand; how the
17 interrupt system of the 6800 is used to enforce timing in the
18 Williams pinball games; and, equally importantly, the organi-
19 zation of the program to achieve this equivalent combination
20 of hardware noise prevention and software noise immunity,
21 real time response, and finally the error recovery, any men-
22 tion of the stuck switch problem as Williams handled it.

23 Q Well, perhaps I didn't make my question clear and per-
24 haps you didn't understand it.

25 My question, sir, was, doesn't this show the

Schoeffler - cross

1 basic system architecture of the Williams solid state pinball
2 games?

3 And I'm not asking you about software or
4 anything like that.

5 Can you answer my question yes or no?

6 A. The direct answer to your question, sir, is, no, because
7 of my definition of architecture.

8 It could easily be yes, if we redefined the
9 word architecture and if you would indicate that architecture
10 is simply how many switches are connected and whether they're
11 in one or more matrices, at that sort of level, and related
12 solely to this aspect of the hardware, then my answer would be
13 yes, sir.

14 Q. All right, sir, I'll accept that.

15 A. Okay.

16 Q. Now, I think we had agreed earlier that the system
17 architecture of the Electronics article and the system archi-
18 tecture of the Nutting '441 patent were different, did we
19 not?

20 A. Using the same definition of architecture, we did agree
21 with that, sir.

22 Q. All right, sir. Again, using the same definition of
23 architecture, can we not now agree that the architecture of
24 the Williams solid state pinball system is different from the
25 architecture of the '441 patent?

Schoeffler - cross

4

1 A. Using -- yes, sir, using that definition of architec-
2 ture, the Williams game shows separate matrices and it shows
3 separate input/output drivers for both the columns and the
4 switches.

5 So the hardware itself, using that definition
6 of architecture, is physically different from the single
7 matrix display that we have on this block diagram.

T5

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1 Q Now I think we had agreed earlier that the '441 patent
2 operated by scanning or strobing over each one of these
3 lines sequentially and cyclically, isn't that correct?

4 A That is correct, sir.

5 Q I think we also agreed, according to the patent, that
6 each one of these lines, 16 columns, going through the
7 lamps, going through the switches, and the numeric displays,
8 are all enabled or strobed simultaneously?

9 A They are strobed or enabled simultaneously, yes, sir,
10 that is correct.

11 Q That is not true of the Williams system, is it?

12 A That is not true of the Williams system, that is. The
13 correct.

14 Q We will come back to that.

15 Q Before the noon hour I did want to have some
16 questions for you about noise suppression in the Williams
17 system, and let's deal with that.

18 We have opened up the Disco Fever game and opened
19 up the backboard, and if I point inside the backboard, I see
20 metallic shielding all around that backboard and I pat it.

21 Can you see that from over there, or would you
22 feel more comfortable coming --

23 A I have observed the Disco Fever shielding, sir.

24 Q What is the purpose of that shielding, sir?

25 A Shielding is a well-known technique for hardware noise-
prevention, notably from external noise.

1940

1 Q Is there anything in the '441 patent that suggests or
2 proposes shielding for noise prevention?

3 A The patent does not specifically explicitly discuss
4 shielding as one of the hardware noise prevention techniques.
5 It actually describes explicit hardware noise prevention
6 techniques as only those that were in the preferred embodi-
7 ment, which is in the Flicker, and Flicker did not have to
8 be shielded. It passed all the noise tests satisfactorily
9 without it.

10 Q It doesn't inferentially or impliedly suggest shielding,
11 does it, the '441 patent?

12 A The diagrams, the pictures do not show shielding. The
13 words in the specification do not describe shielding, that
14 is correct, sir.

15 Q So I take it you are in agreement with me?

16 A Yes.

17 THE COURT: About what? You mean doesn't inferen-
18 tially or impliedly mean shielding?

19 MR. GOLDENBERG: Yes.

20 THE COURT: All right.

21 MR. GOLDENBERG: We get there, Judge. It just
22 takes a bit of time.

23 BY MR. GOLDENBERG:

24 Q Now I point to a perforated metal case in the backboard
25 of the game, and it is sitting in the lower left-hand corner.

1 Can you see that, sir, or have you seen it?

2 A Yes, I can. That contains the transformer that is
3 used with the power supply for the game.

4 MR. GOLDENBERG: It is right there (indicating),
5 Judge.

6 BY MR. GOLDENBERG: is no explicit mention of shielding of

7 Q What is the purpose of that perforated metal structure?

8 A That is to shield the magnetic fields which are commonly
9 associated with power transformers from the circuitry that
10 is nearby on the boards. document what had been used.

11 There Instead of the transformer being in the lower is
12 cabinet, as it is in Flicker and many other games, the
13 transformer has been put into the upper cabinet and technique
14 requires then shielding. So that this makes the shielding
15 of the transformer in the upper cabinet equivalent to what
16 was done in the Flicker machine by putting it in the lower
17 cabinet, namely, the separation of the fields from the boards,
18 where they might disturb them. is not?

19 Q All right. So we will come back to equivalency in a
20 moment.

21 The purpose of that shielding, that is for noise
22 suppression, is it not?

23 A Noise prevention.

24 Q Noise prevention?

25 A Yes, sir.

1942

1 Q The perforated shielding.

2 Now, can we agree that there is nothing in the '441

3 patent which suggests that as a noise prevention technique?

4 A There is nothing -- I don't know whether to answer it

5 yes or no because I can't remember the exact wording of the

6 question, but there is no explicit mention of shielding of

7 transformers in the patent. That is a well-known technique

8 which would have been known to every practicing engineer in

9 1973. There would have been no reason to mention it unless

10 it had been used just to document what had been used.

11 Q There is nothing there inferentially or impliedly, is

12 there, about that noise suppression technique?

13 A That is correct, sir. It is too well known a technique

14 to list and not all noise prevention techniques known to

15 electrical engineers were listed in the specification. Many,

16 many were not listed.

17 Q The noise prevention technique used on the Flicker game

18 was something different, was it not?

19 A Yes, sir. Is, as you said earlier, it is a combination of

20 hardware noise prevention techniques and software noise

21 A No, sir.

22 Q Well, --

23 A What I said earlier was that the Flicker game is a combination

24 of hardware noise prevention techniques and software noise

25 prevention techniques.

1 Q The noise technique used in the Flicker game was to take
2 that transformer and put it in what has been called the cab-
3 inet or the coffin of the game remotely positioned from the
4 backboard in the electronics, isn't that correct?

5 A That is correct, sir.

6 Q Would you say they are equivalent?

7 A I cannot answer that question with a yes or a no because
8 in reading the claim, I do not attempt to find an equivalence
9 for each hardware noise prevention technique that is in the
10 Flicker in the corresponding games.

11 What I am attempting to find is the combination of
12 hardware noise prevention techniques and software noise
13 immunity techniques in the game that work together. So I
14 do not look for that when I am reading the claim.

15 Since the transformer shielding or the separation
16 is one that is inherent in the patent, I do not know for what
17 purpose I would use the word, equivalent. So I just do not
18 know how to answer your question, sir.

19 Q It really is, as you said earlier, it is whatever they
20 are; then you find infringement, isn't that it?

21 A No, sir.

22 Q Well, --

23 A What I said earlier was that you must find a combination
24 of hardware noise prevention techniques and software noise
25 immunity techniques working together to solve the noise.

2
1 That is equivalent to what was disclosed in the Flicker
2 machine. That is what I look for, the combination working
3 together, and then I say it is equivalent to what was
4 disclosed, and through the means plus function language,
5 et cetera, then I claim the infringement.

6 Q All right, sir.

7 Whatever those techniques are as long as there is
8 this combination?

9 A That is correct, sir.

10 In other words, the separation of the boards is not
11 a specific requirement such that if they are not separated.
12 It is hardware and the shielding of the transformer is a
13 hardware noise prevention technique, one of the many that are
14 used in the Disco Fever, but it is the combination that I look
15 for for equivalence because that is what happened in '73 and
16 which made this so different and which led to the invention.

17 Prior to that time, the digital logic designers were
18 doing everything in hardware. Computer programmers were doing
19 everything in software. And what Frederiksen did was
20 recognize that you could economically use the combination to
21 solve the noise problems.

22 THE COURT: You have used the words, working together,
23 and I am not quite sure I understand what that means.

24 Does that mean that the hardware design for noise
25 prevention must in each instance have some software

1945

3
1 counterpart with which it interacts in order to produce the
2 result, or does it simply mean, on the other hand, that the
3 total hardware and the total software addressed to the noise
4 problem must get the job done, whether it acts separately or
5 together in the former sense that I have used the term?

6 Is that question clear?

7 THE WITNESS: Yes sir.

8 THE COURT: All right.

9 THE WITNESS: I cannot answer it yes or no because I lost
10 track of the sense of the yes or no answer.

11 But the answer is that there need not be, in my
12 interpretation -- there need not be a one-for-one correspond-
13 ence; that is, for every hardware noise prevention technique
14 we discover like the shielding of --

15 THE COURT: Yes.

16 THE WITNESS: There need not be something in the software.

17 However, at the other end, if we find eight
18 hardware prevention techniques and three software noise
19 immunity techniques, and there is really no relationship
20 between them, then they are not working together either. It
21 is the marrying of the hardware and the software. There must
22 be some cooperation that so this particular --

23 THE COURT: At what point do you determine that they are
24 merely living together instead of being married, and by that,
25 I mean you say three would not be enough but eight would be

1946

1 enough?

2 Is this a counting process?

3 THE WITNESS: Absolutely not.

4 THE COURT: All right.

5 THE WITNESS: It is not a counting process.

6 What I have to look for is why the hardware was
7 introduced, all right, and that hardware must make possible
8 the software that then exploits it. That is the working
9 together that we have.

10 I could give you an example, sir.

1 THE COURT: Well, now, for instance in Disco Fever,
2 does the cage for the transformer have a software counterpart?

3 THE WITNESS: There is no correspondence that I
4 can think of for that particular hardware noise prevention
5 technique.

6 THE COURT: And for purposes of analyzing the
7 infringement issue, would you just simply put that cage aside,
8 take it out of the equation altogether, and go on to the next
9 item?

10 THE WITNESS: Not quite, sir.

11 What I would look for in doing the infringe-
12 ment study on the machine is, I go through and identify the
13 hardware/software combination solutions for the various noise
14 problems.

15 For example, in the case of external noise,
16 in the case of external noise, this is noise that is coming
17 into the system from the outside, that might be coming through
18 the power lines and the like, or electrostatic noise, then I
19 worry about two things, if I were a designer.

20 One, that the noise pulses that were coming in
21 from electrostatic noise might cause the processor to bomb,
22 was the word we used. That is, the noise would be so severe
23 that it would get on the bus lines of the microprocessor and
24 it could not continue at all.

25 Now, that is one effect of electrostatic

1948

1 noise.

2 The second one we testified about was erratic
3 operation, that is, we read a wrong switch or something like
4 that.

5 Now, the hardware/software noise prevention
6 techniques I'm looking for are, how do we handle the electro-
7 static noise problem.

8 We separate, for example, the boards in the
9 back cabinet from where the electrostatic noise might enter
10 the system.

11 We shield the transformer so that noise that's
12 coming out of the power lines, that will come into that
13 machine, cannot get to the microcomputer.

14 But that solves only part of the noise prob-
15 lem.

16 That must reduce the level of the noise,
17 through hardware prevention, to the level at which software
18 can take over now to eliminate the rest of the noise.

19 Now, I said that wrong. Not eliminate, but
20 live with it. Because software can't eliminate noise.

21 And so those are hardware noise prevention
22 techniques.

23 Now, interrelated with those would be, for
24 example, in the program where I double read the switches.
25 That's done in Disco Fever.

Schoeffler - cross

1949

Through the hardware I've brought the external noise down to this level, so at least the thing won't collapse and bomb.

Now in the software I can live with it by double reading the switches, so that I will know if I read the switches at a noisy time and re-read them at a later time.

That would be a combination of the marrying.

1 A second one, which is more obvious and direct, is
2 the use of matrix multiplexing.

3 When I matrix multiplex, for example, the lamps in
4 the Disco Fever machine, I go from column to column to
5 column lighting the lights.

6 Now, that's supposed to be all hardware that's
7 going around in there.

8 But, now, in the program I cause those strobes to
9 be output, and that gives me the self-cleaning action.

10 So if during noise one of the wrong lamps was lit,
11 okay, it gets corrected the next time I scan through the
12 matrix.

13 Those are the combinations that I'm looking for
14 when I do the--

15 THE COURT: If we had a pinball machine which, by
16 virtue of nine items of hardware, unlike anything found in
17 Flicker, was able to reduce the noise level to a bare minimum
18 so that the one piece of software designed for noise preven-
19 tion was able to finish it off and eliminate all noise, but
20 that one piece of software is totally unlike anything found
21 in Flicker, would that machine infringe?

22 THE WITNESS: Yes, sir. It is because that hardware/
23 software combination is such that the software wouldn't do
24 it -- I assume from your example -- by saying

25 THE COURT: Yes.

1951

1 THE WITNESS: -- without that hardware.

2 THE COURT: Correct.

3 THE WITNESS: And the hardware wouldn't do it
4 without that software.

5 THE COURT: Correct.

6 THE WITNESS: There you are. Those are inter-
7 related, and it would infringe.

8 THE COURT: All right.

9 BY MR. GOLDENBERG:

10 Q Dr. Schoeffler, we can perhaps shorten this aspect of
11 it up.

12 Can you tell me what hardware devices or techniques
13 are used in Disco Fever which are the same as -- and I under-
14 line "the same as," sir -- the same as a device or technique
15 used in the Flicker game or in the '441 patent?

16 A Yes, sir, I will.

17 Sir, was your question directed to both hardware
18 noise prevention and software noise immunity?

19 Q No, sir.

20 A Or just the one.

21 Q Hardware.

22 A Just the hardware.

23 Q And I stress "the same as".

24 A Same. Yes. So we would not include -- by saying
25 absolutely identical, so we would not include the trans-

1952

former shield, is my understanding of your question, is that fair?

Q That's correct, the shielding around the back box.

A All right.

8-1b1

Schoeffler - cross

1 THE COURT: I am sorry. Now I have lost the
2 question.

3 MR. GOLDENBERG: Judge, what I am trying to do
4 is shorten up this portion of the examination, and what I
5 would like the witness to tell me is what hardware devices
6 or techniques are used in the Disco Fever which are the same
7 as those used or disclosed in the '441 patent.

8 BY THE WITNESS: That is what I have in my notes.

9 A. Here are the ones that I discover that are in my notes,
10 sir.

11 BY MR. GOLDENBERG: Is it true that every matrix is self-cleaning?

12 Q. All right. The question is that you are talking about is?

13 A. In no particular order. The first one is the self-cleaning of
14 matrix of lamps. The self-cleaning of digits. That, of course,
15 is both hardware and software but is made possible by the
16 matrix multiplexing of the digits.

17 The second one is the same response for the
18 lamps because they, too, are in a matrix and that permits then
19 software to do the self-cleaning through the matrix multi-
20 plexing in the program.

21 The third one I have on my list is the
22 limiting of the current in a cold lamp to cut down the maxi-
23 mum or peak current and hence decrease the noise. That, too,
24 was done in Flicker.

25 THE COURT: What hardware does that?

Schoeffler - cross

THE WITNESS: On the lamp drive circuits, the transistors and resistors limit that current, sir.

The fourth one in my notes is to put the boards, the electronic boards, in the back box away from the playfield and the noisy elements. That, too, is done in Flicker.

The last is the isolation of the power supply from the logic boards, is what I have in my notes.

BY MR. GOLDENBERG:

Q Let's deal first with the self-cleaning feature.

Isn't it true that every matrix is inherently self-cleaning in the sense that you are talking about it?

A Yes, sir, if one cyclically and sequentially scans a matrix of lamps and digits, the self-cleaning is there, yes, sir.

Q Now let's talk about current limiting.

How is current limited in the '441 patent?

A The drive circuits for the lamps use a transistor, which limits the current.

Q Is that the low beta transistor?

A That is what we have been referring to as the low beta transistor.

Q Tell me once again what beta is?

A Low beta is the current gain of the transistor, sir, but that is a description of a class of transistors. So the

1955

Schoeffler - cross

beta itself, that is just the way those transistors function.

Q What beta values would you call the low?

A In the specification, when the low beta transistor is disclosed in the patent, it specifically mentions low beta being 1,000.

Q Do you agree with that?

A In the discussion in the patent and in the Flicker, that is a particular class of transistor called the Darlington transistor, and that is about as low as the betas get in the Darlington transistor, sir.

Q How high would the beta have to be before you stopped calling it low?

A The beta that is in the Darlington transistors go up into the many, many thousands. There is no abrupt change from low to high.

It is not a technical definition. This is a term that was used by the inventor, Frederiksen, to describe a concept, namely, use of an electronic device to limit the peak currents, and those are his words and his definition.

8-2 20

21

22

23

24

25

initiation Q I understand that, sir. I am asking for yours.

2 He told us he considered 1,000 a low beta. Would
3 you consider a beta of 50,000 to be low?

4 A In a Darlington transistor, no, sir.

5 Q That would be high?

6 A Yes, sir.

7 Q All right, then at least get me to the gray area.

8 A The way I would use the term, any beta more than 10 times
9 the 1,000 Frederiksen mentioned I would say would no longer
10 fall in the class that I would call the low beta transistor
11 in the way I use the term.

12 Q Sir, do you know whether there are any low beta transis-
13 tors in the Disco Fever game?

14 A The Darlington transistors were not used in the drive
15 circuits of the Disco Fever game, sir, and so the word "low
16 beta" that we have just been discussing is not applicable.
17 Those are normal transistors.

18 Q So they are not low beta transistors?

19 A They are not Darlington low beta transistors, that is
20 correct, sir.

21 Q What is the current -- let me withdraw that.

22 Well, I take it as a result of the answer that you
23 just gave me, sir, that the device used for current limiting
24 in the Disco Fever is not the same as the device used for
25 current limiting in the '441 patent?

1957

1 A Your statement is correct, sir; that is, the
2 specific device is not the same. It is not the same numbered
3 transistor that Frederiksen used, nor is it the same type of
4 transistor, namely, a Darlington; but using a Darlington
5 transistor to drive currents in the lamps, the Williams game
6 uses transistors to drive the lamps.

7 Yes, The hardware architecture in your definition is
8 different, 8 rows instead of 4 rows. We are still using
9 transistors to limit current, and that was the basis of my
10 answer that they are the same.

11 Q Do you know in fact what is used to limit current
12 in the Disco Fever game on the lamps?

13 A What I did, sir, while studying the Disco Fever
14 schematics, I looked at the transistors in the drive circuit,
15 looked them up, looked at the resistor values, and came to
16 the conclusion that they could indeed limit the cold current
17 of the lamps.

18 I don't remember the transistor numbers now or the
19 results of my calculations, but that is what I did.

20 Q Isn't it a fact, sir, that what Williams uses to limit
21 current on the lamps is not a transistor at all but a shunting
22 silicon controlled rectifier?

23 A No, sir, that is not my interpretation of the Williams
24 circuit diagram.

25 I had to read the answers so I can refer
to you, but I see the PIC chip, the wires come out, and they

1958

1 Q All right, sir. Do you have it up there?

2 A Yes, I do. There is such a circuit in the Williams
3 game. I interpreted that to be a protection against a catas-
4 trophic failure; namely, a short, which is different from cold
5 current starting protection.

6 Q That is your view of it?

7 A Yes, sir. That is what -- I came to that conclusion.

8 Q Well, can you agree with me that whether or not you and
9 I have an agreement on what they are there for, that there
10 is a silicon control rectifier shunting each lamp drive
11 circuit in the Williams Disco Fever and other games?

12 A Yes.

13 Q This is Exhibit 421. Let's see if we are looking at
14 the same thing.

15 A We are, sir.

16 Q We are?

17 A Yes, sir.

18 That is, There is a silicon control rectifier that is in
19 that circuit closer to the PIA chips, not exactly shunting
20 the drive.

21 Q You said closer to the PIA chips?

22 A Yes, sir.

23 If you examine the diagram, it is so small in my
24 copy. It is very hard to read the numbers so I can refer
25 to you, but from the PIA chip, the wires come out, and they

1959

1 first go by the circuitry there and the transistors around
2 that SCR and then move on to the actual, if I am following
3 it right, transistor, through which the lamp current flows.

4 I am pointing to a transistor -- in fact, it reads
5 Q49, if I am not mistaken. That is the transistor through
6 which the current of the lamp is actually flowing.

7 I have lost it now.

8 The SCR is right in here, and that is in this cir-
9 cuitry further back that is sending the current to that drive
10 transistor.

11 Q What is an SCR?

12 A SCR is a silicon control rectifier.

13 Q Generally, how does it work?

14 A It is a -- just like a diode that allows current to
15 flow in only one direction except it is normally open and
16 no current is flowing until you send a signal to it, and
17 then it acts like a diode. It is like a controlled switch;
18 that is, when you send the signal to it, it is like closing
19 a switch.

1960

1 Q You understand that that SCR is there for what purpose?

2 A It was my interpretation that that was placed in there
3 to prevent catastrophic failure; namely, when one is doing
4 matrix multiplexing, if for some reason the matrix multi-
5 plexing stops, there would be a very high current going
6 through the lamp, and you really want that to go through
7 the lamp only for a short period, in your case, in the case
8 of Disco Fever, one-eighth of the time. So that silicon
9 controlled rectifier would eventually shut that down in case
10 of a failure.

11 A That would be there, in my opinion, because out in
12 the field, if ever anything went wrong with the microprocessor
13 that stopped it from doing the matrix multiplexing, you would
14 have large maintenance problems. You would always be burning
15 out bulbs or lamps on the game.

16 A That was my interpretation, sir.

17 Q Is there anything in any of the instructions or operating
18 manuals that would support your interpretation of that, sir?

19 A I do not recall reading anything like that, sir. It
20 was just my analysis of the circuitry here, and it is con-
21 ventional in the design of any product to analyze failure
22 modes, and anyone that will contribute to the high field
23 maintenance cost to do that.

24 So I did not consider it unreasonable or different.

25 It is like putting a fuse in the power line. You
do not expect the game to short out, but when it does, there

1961

1 is no point in paying a large penalty for it when the fuse
2 is a standard solution to the problem.

3 Q You do not see that playing a current limiting function?

4 A Not the cold current lamp limiting function, no, sir.

5 Q I think, in any case, we do have an agreement between
6 us, there is no low beta transistor in the Williams Disco
7 Fever?

8 A There is no low beta Darlington transistor. There is a
9 different kind of transistor driving that row.

10 Q Is there current limiting?

11 A It was my analysis, sir, that through that transistor
12 and the registers around it in the current that it supplied
13 that it did limit the cold current of the lamp, yes, sir.

14 Q So that is not the same as what is used in the '441
15 patent, is it?

16 A I called it the same. It is the use of a transistor
17 to limit the current.

18 Q If you call being the same requiring the precise
19 same family of transistor and the like, it is clearly not
20 the identical component, sir.

21 A I have seen in the
22 book that the
23 electrical
24 of a transistor
25 is a separation

1962

1 Q All right, sir. The next one you told me about was
2 putting the circuit boards in the back box.

3 A That is correct, sir.

4 Q Separating them from the playfield switches.

5 A That is correct, sir.

6 Q Hasn't the pinball industry for years put some of the
7 controls in the back box?

8 A By controls, sir, are you referring to in the electro-
9 mechanical pinball games?

10 Q Yes, sir.

11 A I actually don't know the answer to that question, sir.
12 I'm sorry.

13 Q We can open up the Flicker game and we'll see.

14 Is there any question in your mind about that?

15 A All I can say is, I've never looked at it to -- that is,
16 I looked at them, but it didn't register in my mind, so I'm
17 not certain.

18 Q All right, sir. Well, assuming my understanding is
19 correct, why wouldn't you put some of the electronic controls
20 in the back box?

21 A If I were -- I would put the electronic controls in the
22 back box, if I were designing a microprocessor based
23 electronic pinball game, and recognize the possibilities
24 of electrostatic noise and noise introduced by the high
25 currents in the playfield, and wanted to get the separation

1 to protect the microprocessor and the other components, I
2 would put it back there, sir.

3 And that's just what Frederiksen disclosed and did.

4 Q And assuming my understanding is correct, you would
5 follow industry practice and put it back there, wouldn't you?

6 A There was no such industry practice in 1973 for separat-
7 ing electronic circuit boards from pinball playfields until
8 Frederiksen thought of doing it.

9 Q I again perhaps didn't make myself clear.

10 But the industry had put some electromechanical
11 controls in the back box, had it not?

12 A If I were following the industry standard, I would have
13 put some of them in the back box and some in the lower box.

14 And that I hope I would not have done, if I had been
15 a designer, which I was not in those days.

16 Q That was good design, wasn't it, good engineering
17 practice, to separate those parts? Wasn't it?

18 A I'm sorry, separate which parts, sir?

19 Q Well, to separate the switches from the electronics.
20 That's good engineering practice, isn't it?

21 A Separate -- yes, sir, separation of electronics that are
22 susceptible to noise from sources of noise is good engineering
23 practice.

24 It does require you to recognize the noise and take
25 it seriously and include it in your design however.

1964

Q All right. The last one I have is the isolation of the power source. I think that's what you said.

A Now, if I understand that, in the '441 patent and in the Flicker game the source is in the game cabinet, is it not?

A The lower cabinet, that is correct, sir.

Q The lower cabinet.

A Now, my question to you, if you might recall, was: You tell me those noise suppression devices, which were the same in the two, that is, the Disco Fever and the '441 patent, and I thought we had earlier agreed that putting the power transformer in the back box and putting the shielding around it was not the same, putting aside the equivalency, was not the same as putting it in the back box.

A You are correct, sir, with respect to the transformer. That is different.

But as I recall from the examination of the Disco Fever, the power supply is in the lower cabinet, is it not?

Q Well, perhaps I misunderstood you. You said the power supply.

A Yes, sir.

Q Are you sure of that?

A I was reading from what my notes are.

May I look at it once more?

Q Surely.

1965

(Brief interruption.)

BY THE WITNESS:

A. I was mistaken, sir. I'd like to go back to my notes to see what I actually have written down. This was on a summary sheet.

In the summary I just gave you I was mistaken. However, when I read the claims on the Williams games, what I actually indicated, according to my notes, that the separation was due to the shielding of the transformer in the back cabinet.

And when I wrote down a summary of all of the different techniques for the game so that I could keep them straight, I wrote down here, "Isolated from the logic boards." And, of course, the isolation is due to the shield.

And we have already agreed that that shield is not the same way the power supply was isolated in the Flicker.

So I read my summary and interpreted it wrong just now, sir.

1 Q Now real time and solenoids, in the Williams game would
2 You agree with me that what Williams calls a jet bumper and
3 a slingshot are things which have to be activated in real
4 time?

5 A Yes, sir, I agree with you.

6 Q The ball hits one of those things and you want it to
7 immediately carom off to goodness knows where, right?

8 A That is correct, sir.

9 Q You want to stay on the playfield, but...

10 So you want that in real time.

11 In the Williams game, how are those solenoids
12 operated?

13 A In the Williams game those solenoids are called special
14 solenoids, which means that they are activated either by the
15 microprocessor when the microprocessor wants to close those
16 or by a playfield switch which is directly connected to
17 activate it.

18 It is my understanding that even though it can
19 be run either way, that during the operation of the game and
20 not during maintenance phases, that it is what we said yester-
21 day with respect to the Gottlieb solenoids, that it was direct
22 driven; namely, the closure of the switch by the ball hitting
23 the switch causes the solenoid control and the microprocessor
24 does not cause the solenoid directly to close.

25 Q So the occasion when the processor operates those

1 solenoids, you are not terribly interested in real time. This
2 is during a testing or maintenance operation, is it not?

3 A If my understanding is correct, that that is used only
4 during maintenance, then you are correct; the activation time
5 during maintenance is not.

6 Q So during play of the game, when you are interested in
7 real time, the processor has nothing to do with it, isn't that
8 correct?

9 A That is not quite correct, sir. The processor does not
10 actuate the solenoid. The processor must in real time detect
11 the switch closure and do whatever functions are associated
12 with the switch closure in any case where, for example, a
13 light must be lit or if there is a score that would be associ-
14 ated, but it does not cause the solenoid itself to close.

15 Q How many swit--

16 A When -- excuse me, sir.

17 Q I am sorry.

18 A If we are talking about the six special solenoids in
19 these games.

20 Q How many switches are associated with those special
21 solenoids in Disco Fever?

22 A I did not count those switches.

23 Are you asking me how many special solenoids
24 are there, sir?

25 Q No, sir, take any one solenoid.

1968

Schoeffler - cross

1 A I did not count them, sir, to determine whether any
2 switches on that game -- there has to be one to close the
3 solenoid. Normal practice would be if you were going to signal
4 the processor that it was closed, there would have to be a
5 second, but I did not count them, sir.

6 Q So you don't know? In the lamp matrix and the switch

7 A I don't know.

8 Q That is different than what is in the '441 patent, is
9 it not?

10 A No, sir, it is not. The '441 patent specifically dis-
11 closes lamps -- I am sorry, solenoids, starting solenoid, in the
12 switch matrix and in the lamp matrix, sir.

13 Q All right, sir. I am not going to go through that
14 again. We have dealt with that a number of times.

15 Let us come back to this question of the matter
16 of strobing the matrix.

17 Very briefly, the matrix of the '441 patent is
18 strobed cyclically and sequentially, isn't that correct?

19 A That is correct, sir.

20 Q Under processor control.

21 Let's assume it starts on the left-hand side. It
22 passes column 1, the lamps, solenoids and displays in that
23 column, then goes on to column 2, and so forth. Is that
24 correct?

25 A That is correct, sir.

Q Now let's take the Williams game on strobing. Is it

1989

1 Q Now, can you tell me whether or not in the Disco Fever
2 game there are diodes on the various playfield switches and
3 the lamps?

4 A The answer is yes, sir. According to the schematics in
5 the Disco Fever and other Williams games documentation, there
6 are steering diodes in both the lamp matrix and the switch
7 matrix.

8 Q That is different than what is in the '441 patent, is
9 it not?

10 A No, sir, it is not. The '441 patent specifically dis-
11 closes lamps -- I am sorry, diodes, steering diodes, in the
12 switch matrix and in the lamp matrix, sir.

13 Q All right, sir. I am not going to go through that
14 again. We have dealt with that a number of times.

15 Q Let me come back to this drawing and the matter
16 of strobing the matrix. Very briefly, the matrix of the '441 patent is
17 strobed cyclically and sequentially, isn't that correct?

18 A That is correct, sir.

19 Q Under processor control.

20 Let's assume it starts on the left-hand side. It
21 enables column 1, the lamps, switches and displays in that
22 column, then goes on to column 2, and so forth. Is that
23 correct?

24 A That is correct, sir.

25 Q Now let's take the Williams system on strobing. Is it

1970

1 the same?

2 A The architecture of the Williams game is different, as
3 we agreed before, because it is multiple matrices, sir.

4 Q Are you speaking of all, one, or -- it is different
5 because there are multiple matrices.

6 Q Well, you and I have agreed on what the '441 patent is.

7 A Yes, sir.

8 Q I asked you to tell me is it the same in the Williams
9 system?

10 A Yes, sir, in the case of each matrix, separately it
11 is the same; namely, the lamp matrix is cyclically and
12 sequentially enabled and the switch matrix is cyclically
13 and sequentially enabled and the numeric display or the
14 digit matrix is cyclically and sequentially enabled, sir.

15 Q Take any column in the switch matrix, a corresponding
16 column in the lamp matrix, and a corresponding column in
17 the numeric display. Are they enabled at the same time?

18 A They are not enabled at the same time necessarily.

19 Q But I testified that it is at the same time.

20 Q What did you mean by it?

21 A At the time I testified, I said Claim 46, among all the other

22 claims, I believe I indicated Claim 46, further restricts it:

23 narrow Claim 46 refers to a single matrix. And because

24 I was asked to clarify, I indicated that Claim 46 does not

25 read "matrixes".

Schoeffler - cross

1 Q So that is a difference?

2 A That is a difference, not from the patent. It is a
3 difference from the preferred embodiment as disclosed in the
4 patent, which restricts it to the single matrix.

5 In the section of the patent that you had me read
6 before lunch that talked about this, that was prefaced earlier
7 in that same column by a restriction to the preferred embodi-
8 ment. So it is not the same. It is not precisely the same
9 as this, but as we indicated in reading the claims on the
10 Williams game, that under certain conditions it is equivalent
11 when we were discussing infringement under Claim 46.

12 Q Why is it equivalent, sir?

13 A You are asking me why Claim 46 reads on the --

14 Q Put Claim 46 aside. You said it is equivalent.

15 Why is it equivalent? What do you mean by that?

16 A The only time I mentioned the word, equivalence, was
17 when I was reading Claim 46 on the Williams game, sir.

18 Q Well, you just mentioned it again.

19 A But I mentioned Claim 46 at the same time.

20 Q What did you mean by it?

21 A By the equivalence, I mean Claim 46, among all the other
22 elements, because it includes Claim 45, further restricts or
23 narrows Claim 45 to refer to a single matrix. And because it
24 is not a single matrix, I indicated that Claim 46 does not
25 read literally on this.

Schoeffler -cross

Claim 45 does read literally, but Claim 46 does not.

I indicated that under the doctrine of equivalence, if I find that this organization is equivalent in the sense that it carries out substantially the same function substantially the same way to produce substantially the same results, then I can say it is equivalent, and we say it is infringement under the doctrine of equivalence.

I found equivalence by observing that the characteristics of the single matrix, which was disclosed in the preferred embodiment, carries 2 main attributes; namely, the efficiency because of the saving of hardware components, as we discussed a while ago, and, secondly, because that is a prime example of this hardware/software working together principle because, by having them in a separate matrix -- in a single matrix and enabling them, I can offset in time and read the switches at a non-noisy time.

I determined then in examining the Williams games that the advantage of the hardware efficiency had been obviated by the change of the technology, notably the movement to an 8-bit transistor where they need to have 16 columns, which you need for the digits, is not present for either the lamps or the switches, and that in the depositions -- I could look up the pages -- that was indicated that there was no need for that many switches or lamps.

So we go to separate matrices so they can be of

1 separate size.

2 However, the separate matrices are organized and
3 driven in the Williams game using a hardware advance available
4 on this microprocessor. That was the interrupt system that
5 did allow me to insure that at the times when I did the digits,
6 the lamps, and the switches, that I was in a low-noise situa-
7 tion with respect to the reading of the switches. And, hence,
8 this hardware/software combination is equivalent to what was
9 done in the preferred embodiment disclosed in the patent,
10 and I concluded then that they were equivalent.

11 THE COURT: Let's take a ten-minute recess.

12 MR. GOLDENBERG: Thank you.

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-1b1 Schoeffler - cross

1 (Brief recess.)

2 BY MR. GOLDENBERG:

3 Q Dr. Schoeffler, in the Disco Fever game, tell me how the
4 switches are scanned.

5 A In the Disco Fever game the switches are scanned in what
6 is called the background or executive loop of the software in
7 a cyclical and sequential manner.

8 Q And by that you mean it starts at one end of the matrix
9 and goes completely through the matrix?

10 A The typical situation is exactly the one that you just
11 described, because the purpose of the cyclical and sequential
12 scanning of switches is to detect all switch closures, at
13 least to a practical level in the machine.

14 Q All right, sir. Suppose, as it starts through the
15 matrix, it detects a switch closure. What does it do?

16 A In the Disco Fever, based on my -- incidentally, this
17 is based on my reading of the depositions; of course, I have
18 no access to the program for the Disco Fever -- it is my
19 understanding that the switches, the switch matrix is scanned
20 cyclically and sequentially.

21 If in a given column it finds a switch closed,
22 then the program goes off and operates a response to that
23 switch closure to do whatever the game rules require associa-
24 ted with that switch closure.

25 Q And so the switch scan is interrupted at that point, is

Schoeffler - cross

1 it not?

2 A. Yes, sir. In any game when a switch is discovered
3 closed you must do something about it, record it or what have
4 you.

5 Q When it resumes the scan, assuming it does, does it
6 continue on in the matrix, or what?

7 A It is my understanding from the depositions that in
8 both Disco Fever and the Black Knight it does, the scanning
9 is cyclically and sequential.

10 In the Flash and the games after the Flash,
11 but apparently up to the Black Knight, that that scan was
12 aborted and then restarted in column 1, sir.

13 Q So there's a difference there.

14 A I don't consider that a significant difference. I con-
15 sider it essentially identical, sir.

16 Q My question was that there is a difference.

17 A From Flicker, sir?

18 Q Yes, sir. From the '441 patent, although the '441
19 patent really doesn't tell us very much about that, does it?

20 A The analysis of the program does.

21 And as I testified yesterday, there are con-
22 ditions in the program that is part of the patent where, upon
23 detection of the closure of a switch, depending on the par-
24 ticular switch, it does not pick up in the next column again
25 to continue the scanning under those conditions.

Schoeffler - cross

And so that these, as I also testified on direct exam, these conditions occur a tiny percentage of the time. When a switch is detected, normally we know the situation on the game board.

And so my conclusion was that this is substantially the same function, namely, cyclical and sequential scanning, whether it starts and stops or not.

Q And I think you would agree that this is a very simple function, and that it is a very simple function.

A Yes, it is a very simple function, and it is a very simple function.

Q And I think you would agree that this is a very simple function, and that it is a very simple function.

A Yes, it is a very simple function, and it is a very simple function.

Q And I think you would agree that this is a very simple function, and that it is a very simple function.

A Yes, it is a very simple function, and it is a very simple function.

Q And I think you would agree that this is a very simple function, and that it is a very simple function.

A Yes, it is a very simple function, and it is a very simple function.

Q And I think you would agree that this is a very simple function, and that it is a very simple function.

1 Q Dr. Schoeffler, my question was that there is a differ-
2 ence, is there not?

3 Could you answer that, sir?

4 A The direct answer to your question is no, there is no
5 difference in the sense that there are times when in both
6 machines when a switch is detected, the successive scans may
7 not proceed in the next column.

8 Q You spoke of this going off and doing something else,
9 and I think you -- well, I am sorry. Let me put it this way,
10 sir.

11 Isn't it a fact that the microprocessor can only
12 do one thing at a time?

13 A No, sir, the correct term is to say the microprocessor
14 can do only one instruction at a time. The effect of that
15 instruction is another matter.

16 Q So whether we are talking about '441 or Williams or
17 Gottlieb or anything, at any single time it can only sense
18 a switch closure or act on a switch closure or enable a
19 lamp or light a lamp and the same thing with scoring display;
20 it can only act on instructions for those things serially, can
21 it not?

22 A Yes, sir, the instructions are serial, but the actions
23 that are initiated then are concurrent and can go on long
24 after the duration of the instruction.

25 Q Well, I am not sure I am understanding you there.

1 We are scanning the switches and so at a certain
2 period of time, we have detected a switch closure, correct?

3 Let's talk about the '441 patent.

4 A Yes, sir.

5 Q What does the computer do?

6 A In the computer program that is part of the patent,
7 when it scans a column of switches and determines that one
8 or more is closed, it goes through a column debounce routine,
9 that is, a series of instructions, to determine whether
10 that column has changed from the last time the column was
11 scanned, and if it has indeed changed, it then proceeds
12 with other instructions to determine whether only one switch
13 is closed or more than one.

14 If only one switch is closed, it then goes off
15 to the sub-routine, as it is called in the patent disclosure,
16 which determines how to respond to that switch; namely, if
17 it is a target, perhaps to light a light or to indicate
18 that that light should be lit, et cetera.

19 Q In order to do that, a certain number of instructions
20 must be executed?

21 A That is correct, sir.

22 Q How many instructions are involved? Let's say the
23 function of the thing is to sense a switch.

24 A That question can't be answered with a simple number.
25 It depends on where you want to start counting and where you

1 want to stop ending, but I can answer it in the following way,
2 sir.

3 The routine in the program that is labeled "Switch"
4 that includes all of the instructions and steps to carry out
5 through the column debounce stage, without counting them
6 right now is probably 15 or 20, something like that.

7

8 How much time is required per instruction?

9 In the 4004 microprocessor, the instruction cycle time
10 is about 10 microseconds, S.R.

11 So that is 10 microseconds?

12 More or less.

13 More or less.

14 As executing a sequence like that. Not necessarily, all
15 the instructions are executed. Sometimes there are branches
16 and jumps around them, but it is on the order of 100 to 150
17 microseconds, I would guess.

18 What does it do at the end of that particular routine?

19 At the end of the switch routine, it returns to where the
20 subroutine or switch was called from in the program logic
21 of the program. So it returns to that main executive loop of
22 the program, sir.

23 And does the same thing over again?

24 So, sir, at that point in the program it goes to deter-
25 mine whether there was any change or what it is to do next.

1 Q I counted about 25 at one point in time. It would be in
2 that order, 20 to 25?

3 A It is easy enough to look at the program, sir, and
4 determine that.

5 No, sir, I counted 17.

6 Q 17, I suspect you are more experienced in reading those
7 things than I am.

8 A Yes, How much time is required per instruction?

9 A On the 4004 microprocessor, the instruction cycle time
10 is about 10 microseconds, sir.

11 Q So that is 170 microseconds?

12 A More or less.

13 Q More or less.

14 A As executing a sequence like that. Not necessarily all
15 the instructions are executed. Sometimes there are branches
16 and jumps around them, but it is on the order of 100 to 170
17 microseconds, I would guess.

18 Q What does it do at the end of that particular routine?

19 A At the end of the switch routine, it returns to where that
20 subroutine or switch was called from in the main executive loop
21 of the program. So it returns to that main executive loop of
22 the program, sir.

23 Q And does the same thing over again?

24 A No, sir, at that point in the program it tries to deter-
25 mine whether there was any change or whether it has to act.

1 If it does not have to act, it then goes up and
2 starts the entire loop again, which is the multiplexing and
3 the lamps and the digits, the next column, sir.

4 Q How does the Williams system work?

5 A The Williams systems vary slightly for the 3 representa-
6 tive Williams games, sir. Do you have one --

7 Q Well, let's take Disco Fever.

8 A Yes, sir. In the Disco Fever game, the executive loop
9 or background program -- people use different terms for
10 these -- it's like the main loop of the Flicker game in that
11 one proceeds through cyclically and sequentially scanning the
12 switches. However, the lamp and the digits, those column
13 operations are handled by hardware interruption to initiate
14 the program modules that move to the next column of digits
15 and the next column of lamps.

16 Q That is different, is it not, from the simultaneous
17 enablement that goes on in the '441 patent?

18 A Yes, sir, they are not simultaneously enabled, the
19 columns in the Williams architecture.

20 architect of the Williams system is a lot closer to the
21 system architecture of the Electronics article than it is to
22 the architecture of the '441 patent?

23 You are saying, then, this very special definition of
24 architecture, which is simply showing the combination of the
25 single early design -- the fact that we have a matrix of

1 Q That is in none of the three Williams systems, is that
2 the case? Are they simultaneously enabled?

3 A In none of the three Williams systems are they simul-
4 taneously enabled, that is correct, sir.

5 Q What was the filing date of the '441 patent?

6 A I do not know, sir.

7 THE COURT: August 25, '78.

8 MR. GOLDENBERG: August 25, 1978.

9 I am sorry. This is the reissue, Judge.

10 THE COURT: Oh.

11 MR. GOLDENBERG: The filing date of the original
12 was May 13th, 1975.

13 THE COURT: Excuse me.

14 BY MR. GOLDENBERG:

15 Q The Electronics article, this exhibit we have been
16 talking about, that is more than one year prior to that date,
17 is it not?

18 A That is correct, sir.

19 Q Can't you agree with me, sir, that the basic circuit
20 architecture of the Williams system is a lot closer to the
21 system architecture of the Electronics article than it is to
22 the architecture of the '441 patent?

23 A You are still using this very special definition of
24 architecture, which is simply showing the combination of the
25 vendor supply chips and the fact that we have a matrix of

1 lamps and a matrix of switches and numeric displays. The
2 appearance is much closer than that, just for that narrow
3 definition.

4 Q I just want to be sure that the record is clear. When
5 you said, "than that," that the appearance of Exhibits 11-F
6 and 4-D is much closer to each other than they are to Exhibit
7 13-E, is that correct, with this definition?

8 A That is correct, for your very narrow definition of
9 architecture, sir.

10 MR. GOLDENBERG: All right, sir. I have no further
11 questions.

12 One second.

13 (Brief interruption.)

14 MR. GOLDENBERG: Judge, I have no further questions
15 of the witness.

16 THE COURT: Yes, I heard.

17 Mr. Schnayer.

18 MR. SCHNAYER: Your Honor, can I ask how late we
19 are running today?

20 THE COURT: Well, I was thinking maybe 5:30, 6:00
21 o'clock, if necessary. If we can finish up here by 6:00
22 o'clock, let's do it.

23 MR. SCHNAYER: Can I have about two minutes of time,
24 Judge? It will take one second.

25 THE COURT: I have got a bunch of other cases set

Let's see. Nobody has cancelled?

THE COURT: We will go until 4:30.

THE COURT: I have got an hour's worth of work
the cases that are set for 4:30. So there is no
our waiting around. It may be longer than that.

Yes, I will.

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REDIRECT EXAMINATION

BY MR. SCHNAYER:

Q Dr. Schoeffler, I show you Page 1502 of the transcript of your testimony of Mr. Lynch's cross examination, and I ask you particularly to read aloud those first nine lines.

THE COURT: Excuse me just a moment.

What I have for 4:30 is not as extensive as I had thought. These are pretrial status hearings. They are not pretrial conferences. So maybe I can wrap that up in 15 minutes or so. So I think I will ask you to stand by at 4:30. I will get back to you.

MR. SCHNAYER: If I can have one minute?

THE COURT: Sure.

(Brief interruption.)

BY MR. SCHNAYER:

Q Dr. Schoeffler, could you please read those first nine lines on Page 1502 of the transcript of your testimony, Mr. Lynch's cross examination?

A Yes, sir.

The question was asked of me:

"Q So what you are saying then, Dr. Schoeffler is effectively Claims 2 and 3 do not alter the scope or content of Claim 1; isn't that correct?

"A No, sir. I have to use the words that I was taught about in reading the claims; namely, it gives

the specific structure in contrast to the means language.

"Q But you are reading the means language to mean that very structure specified in Claim 2 and Claim 3, correct?

"A. That is correct."

Have you had an occasion to review this testimony to determine whether it is accurate?

A. I have, and I determined that I had misread Claims 2 and 3.

Q Could you please explain?

A. Yes, sir.

When I was reading Claims 2 and 3, in both cases, I neglected the phrase, plurality of sets, and without that phrase, I think my answer was correct, that when you include the plurality of sets, that puts a condition on the claim, which makes Claim 2 narrower than Claim 1, which it includes, and also Claim 3 narrower or more narrow than Claim 1.

With the letter I two rows of lamps, then this would be a matrix, for example, that includes two rows of lamps.

And if I used the letter S for switches and I had some switches in a single column like this, then I would have a situation upon which I would read out with which Claim 2 would not read. I think I do not have a plurality of sets of switches as in Claim 2, which would be in Claim 3. Now, we can read this -- this is Claim 1 and I can-

1 Q And would you please give an example of where some --
2 we'll take the blackboard, one of these sheets of paper --
3 and give an example of an arrangement which would be covered
4 by claim 1 and not claim 2.

5 A Yes, sir.
6 Claim 2 calls for a plurality of sets of elements.

7 As we discussed at that time, by a set of elements
8 we mean the elements in a column. And the set must contain
9 two or more elements.

10 And so a plurality of sets requires the response
11 means in Claim 2 that there be at least two sets or two
12 columns in which there are switches.

13 And that is not a restriction in Claim 1.

14 And so if I could draw just an abbreviated diagram
15 of a matrix, where these are the rows and the vertical lines
16 are the columns and they are not connected as usual.

17 I And if I were, in a shorthand way, to indicate
18 with the letter L two rows of lamps, then this would be a
19 matrix, for example, that includes two rows of lamps.

20 And if I used the letter S for switches and put
21 some switches in a single column like this, then I would
22 have a situation upon which Claim 1 would read but upon
23 which Claim 2 would not read, because I do not have a plural-
24 ality of sets of response means, namely switches, in claim 2.

25 Q Now, we can label this -- this is Claim 1 and 2 com-

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1 parison.

2 And beneath that let's do a comparison of a
3 similar example with Claim 1 and Claim 3.

4 A An example that would be appropriate to illustrate
5 the narrowing of Claim 1 by Claim 3 would be to simply inter-
6 change the letters S and L so that I had only a single
7 column in my matrix in which I had lamps. And as
8 I have a set but not a plurality of sets of lamps, and so
9 in this particular example, Claim 3 would not read on that
10 combination of lamp and switches being matrix multiplexed.

11 Q Now, Dr. Schoeffler, I think you testified in Mr. Lynch's
12 cross examination -- 20 exhibits which were labeled as
13 Defendants' Exhibits 20-A through 20-E, there are several
14 pages which Mr. Lynch was making notes as you were talking.

15 Have you had an occasion to examine some of those
16 charts and determine if there are any errors in those charts?

17 A I have. In particular, when we were creating that chart
18 I was having difficulty expressing some of these various noise
19 references that appear in the patent.

20 In particular, the ones that appeared on the dia-
21 grams that showed, for example, on the diagram that the
22 boards were separated, but where there were no words that
23 specifically said noise, the fact that that appeared in the
24 patent in the diagram, that it would be self-evident to an
25 electronic engineer of the day what that meant.

1 And we ended up writing "Inferred" in many of
 2 these, when the proper term should have been "Inherent".
 3 And that would clarify many of those elements if we were to
 4 change it and make the diagram a little bit more accurate and
 5 useful.

6

7 Q Now, Mr. Schoeffler, I want to ask you to correct all the words
 8 wherever you had written a different word --

9 A Yes, Mr. Par. Yes.

10 Q Now, Mr. Schoeffler, I want to ask you to correct all the words --

11 A Yes, Mr. Par. Yes, through the elements, the questions, and the
 12 words to three words, and not to back.

13 Q Now, Mr. Schoeffler, have you done a study to determine
 14 whether or not Claims 45, 46, 47, 48, 49 and 50, which are the
 15 representative claims of the Nutting et al. patent, read on
 16 the "Blacker" mill machine?

17 A Yes, I have.

18 Q And what was your conclusion in this regard?

19 A I concluded that they do read on the "Blacker" mill
 20 machine.

21 Q Have you identified those "readings" at this time?
 22 A At great length.

23 Q What did you use your understanding of the operation
 24 of the "Blacker" mill?

25 A I have my understanding of the "Blacker" mill, as the schematic.

Schoeffler - redirect

Q So, for example, it says "inferred" for the low beta transistor.

Is this the correct word that makes this accurate?

A That's an example of where I would have preferred the word "inherent" in the diagrams.

Q So Mr. Lynch didn't go back and correct all the areas where you had preferred a different word --

A No, sir. Part way --

Q -- he just left the word.

A Part way through the exercise, the questions, we did switch to those words, but did not go back.

Q Dr. Schoeffler, have you done a study to determine whether or not Claims 45, 46, 47, 48, 49 and 95, which are the representative claims of the Nutting et al. patent, read on the Flicker pinball machine?

A Yes, I have.

Q And what was your conclusion in this regard?

A I concluded that they do read on the Flicker pinball machine.

Q Have you testified about this previously at this trial?

A At great length.

Q What did you base your understanding of the operation of the Flicker on?

A I base my understanding of the Flicker on the schematics

2
1 that were -- the schematic diagrams that were available for
2 the Flicker machine; the computer program which was submitted
3 as part of the patent; an examination of Flicker where I
4 observed the operation of the game and where I looked at the
5 boards and I looked at the playfield and the like, not with
6 the intent of tracing wires and all that, but simply to see
7 the general organization; and the testimony of Mr. Frederiksen.

8 Q Dr. Schoeffler, I show you Plaintiff's Exhibit PX-436
9 and ask you if you recognize that?

10 A Yes, I do, sir. This is a copy of the Flicker computer
11 program which is part of the patent.

12 Q And did you use this at all in any of your evaluation--

13 A Yes, I did.

14 Q -- of the operation of Flicker?

15 A I did, sir, very much.

16 Q And Dr. Schoeffler, I'm also going to refer you to
17 Plaintiff's Exhibit 28, 52 and 53 -- and unfortunately we
18 don't have enough stands here -- but I'll see if I can rest
19 that on there -- this is 52 and this one is 53 and here is
20 PX-28, and I'll try and rest these up here.

21 And I ask you to identify those -- excuse
22 me one second.

23 (Brief interruption.)

24 BY MR. SCHNAYER:

25 Q Yes, this is the right one, PX-28.

Schoeffler - redirect

1 A. Those are blow-ups of the two schematics and the copy
2 of the mux chart from the patent that I used as part of my
3 study of Flicker, sir.

4 Q. And you testified with respect to those on direct
5 examination about the operation of the Flicker. Isn't that
6 correct?

7 A. That is correct, sir.

8 Q. Now, Dr. Schoeffler, did you have an occasion during the
9 last recess, the five-week recess, to compare the schematic
10 diagrams to the Flicker machine, PX-333, to determine whether
11 the circuitry contained in that machine is the same as the
12 circuitry that's shown in those schematics?

13 A. Yes, sir, I spent about a day and a half looking at the
14 underside of the playfield and looking at the wiring that
15 comes down into the playfield; and I looked at the circuits on
16 the driver board and traced the wires in the playfield up
17 to the driver board.

18 And I tried to examine all the chips without
19 touching them that were on the CPU board in the system.

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1 Q How much time did this take?

2 A I spent about a day and a half doing that, sir.

3 Q Dr. Schoeffler, I show you Plaintiff's Exhibit 28-A
4 and ask you what that is?

5 A That is the same circuit diagram as I believe is
6 Exhibit 28, which is the circuit diagram of the CPU board that
7 I had studied, and what I did there was color in the changes
8 that I was able to detect by doing chip comparisons and
9 examination of the CPU board without tracing wires.

10 Q Dr. Schoeffler, will you go through each of those
11 yellow portions on the PX-28 and explain what significance,
12 if any, they have in the operation of the Flicker game?

13 A I believe they are numbered. Maybe we could start
14 with No. 1 and then work up to No. 4.

15 A Yes, sir. I found four changes in comparing the chips
16 with the schematic.

17 This is the schematic diagram of the small board
18 in the back of the Flicker, where the microprocessor itself
19 is contained.

20 Q Maybe you could explain what a schematic diagram is
21 so the Court understands.

22 A All right, sir. Each of these little rectangles
23 represent one of the electronic chips. This happens to be the
24 4004 CPU.

25 All of the lines here indicate the wires that

1 connect them together, along which data runs.

2 Q By the chips, you mean those are the little black things
3 with the legs coming out?

4 A That is correct, that populate these and have the
5 electronic circuits within them, the small Domino-like things.

6 Now, what I found was the following: Starting here
7 in the lower right-hand corner with No. 1, this is where the
8 input/output section of the Flicker hardware is done, namely,
9 the setting up or the enabling of the segments for the digital
10 displays, the setting up of the outputs for the lamps, and a
11 row for reading the switches.

12 On this diagram there was shown a second row for
13 possibly reading switches in, which apparently was never
14 implemented or wired, and as a consequence, the resistors and
15 this chip, which is labelled 14502, in the lower right-hand
16 corner of the diagram are not present.

17 That is totally consistent with the organization
18 of the software, the testimony of Frederiksen, and the like.

19 There was only one row of switches -- I am sorry,
20 one row of -- one set of four rows of switches in the Flicker
21 game. They were read in four at a time.

22 So Item 1 shows the missing chip and these. This
23 has no consequence in the operation of the game whatsoever.

24 The second change --

25 MR. GOLDENBERG: Your Honor, I object to this line of

Schoeffler - redirect

1 questioning and its continuation. It is far, far beyond
2 the scope of any cross examination of this witness.

3 THE COURT: Well, it may be. On the other hand, it does
4 relate to the matters that we talked about before the
5 resumption of the trial, and I will consider this a re-opening
6 of direct examination for the purpose of clarifying the
7 record.

8 MR. SCHNAYER: That was our intention, your Honor.
9 Thank you.

10 MR. GOLDENBERG: Thank you.

11 THE COURT: I think this is the time for me to
12 interrupt briefly to take these other cases.

13 MR. SCHNAYER: Thank you, your Honor. Could we just
14 leave the --

15 THE COURT: Yes, you can just leave everything there.
16 You can leave all your papers there.

17 MR. SCHNAYER: Thank you, your Honor.

18 (Brief recess.)

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Schoeffler - redirect

1 THE CLERK: 78 C 2246, Bally v. Gottlieb, case on
2 trial.

3 THE COURT: While I'm thinking of it, let me advise
4 you that tomorrow we won't be able to get started until
5 11:00 o'clock. And then we'll go all day Friday.

6 MR. TONE: May I inquire of your Honor about how
7 late you will run? I have scheduled a trip down to Champaign-

8 THE COURT: Today, you mean?

9 MR. TONE: No. Tomorrow.

10 THE COURT: Tomorrow.

11 Well, no later than, why don't we say, 5:30.

12 MR. TONE: All right. Thank you.

13 BY MR. SCHNAYER:

14 Q. Dr. Schoeffler, you were testifying about these various
15 portions of the circuitry on PX-28-A, and indicating what
16 significance they had, if any, to the operation of the
17 Flicker game.

18 Would you please continue with that explanation.
19

20 A. Yes, sir.

21 I had indicated that the chip in the corner
22 that I had numbered with the red letter 1, the 14502 and
23 associated resistors, were just absent, and that that was con-
24 sistent with the operation of the program, et cetera.

25 Because there is only one row -- one set of

Schoeffler - redirect

four rows for switches. And it has no effect whatsoever; it has no significance whatsoever on the operation of the Flicker.

Item 2 on my list is associated with the switches coming into the CPU board.

And the schematic originally showed an electronic chip whose number is 14502.

These chips are all standard chips that you can look up in vendor catalogs, and they have different types. And so they were commonly abbreviated with numbers such as this.

This has been replaced by another chip, 14016, which did substantially the same function, namely, allowed the switch inputs to be put onto the data lines and put into the memory of the computer.

And so this change, too, had no effect whatsoever on the operation of the Flicker machine.

Q. Now, how many rows were there in the Flicker machine that you testified about, how many rows of switch inputs were there?

A. There were four rows of switch inputs in the Flicker machine, and that's in agreement with the entire operation of the computer program, the debounce routine and all that.

So all of this is consistent. There is no change of significance.

Schoeffler - redirect

For some reason this chip, one chip was used instead of another on the board itself.

The third change from the schematic that I've labeled 3 is also in the right-hand corner, and this is associated with the lamp drive circuit.

This is a typographical error, a draftsman error, in my opinion.

The chip on the original schematic is labeled 14543, and what is actually present on the board is a chip called 14042.

And it appears that the draftsman, in drawing this, copied the wrong number. Because right above it on the diagram is another chip with that number.

It would have been electrically impossible for that chip that was originally there to have carried out that function.

And shown on the original diagram were the pins associated with the chip, and those are entirely consistent with the pins specified for the chips adjacent to it, which also are 14042.

So these three chips on the board are actually identical and are displayed as identical here.

And looking at the electrical function, it must have been a typographical error, and so it has no significance to the operation of the machine.

Schoeffler - redirect

Q Now, you indicated that there were pin-outs that are shown. What significance do these pin-outs have with respect to your reason for concluding this was a typographical error?

A The numbers on the wires, if one looks it up in a vendor's catalog, can be associated with the physical pins or connections to the board. And that determines what the function of that pin is and how it must be used.

And the pin numbers here are consistent with the pin numbers on the other 14042 chips; totally inconsistent electrically with the one that was there.

So it had to be a typographical error.

1 Q By the 1 to 30, you mean the 14543?

2 A Yes, the one that we indicated, that is correct.

3 The last change is across the top of the diagram,
4 and I have labeled it as 4, and it is actually shown in sev-
5 eral parts. I have colored in or highlighted with yellow
6 these little triangular buffer electronic circuit devices
7 that are shown up here, and there are five of those.

8 Unlike the chips, which are shown as rectangles,
9 these designate electronic circuits, and when one implements
10 or builds this, actually, six of those little electronic
11 circuits are contained in one chip.

12 What we found -- what I found on the circuit board
13 is that one such chip was changed. The circuit diagram here
14 calls for a chip whose number is 14050, and it was changed to
15 a chip whose number is 14049.

16 It turns out that the electronics in those two
17 chips are essentially identical in function except for one
18 characteristic. The 14050 electronic circuit passes the data
19 through that is coming in on the one side to the other side
20 and isolates the two sides but does not change the data.

21 The 14049 that is present on the Flicker does the
22 same thing except it inverts the data; that is, if the data
23 coming in was low, it changes it to high, and if it was high,
24 it changes it to low. But aside from that, there is no change
25 at all.

Now, elsewhere on the circuit diagram there are

1 many of these 14049 chips used, and, apparently, at the
2 time this was constructed, the 14050 was changed to a 14049.
3 For what reason I do not know, perhaps lack of availability
4 of the chip. I do not know.

5 Now, the effect of this on the diagram, since the
6 electronic circuits appear in three places, is the following:
7 Four of them appear near the center top of the diagram and
8 are associated with the timing signals called the clocks
9 that run the microprocessor.

10 Changing the 14050 to 14049 electronic circuits
11 has no effect whatsoever on that. So these are inter-
12 changeable as far as this portion of the circuit is con-
13 cerned.

14 On the left, changing the electronic circuit
15 14050 to 14049 in this portion of the circuitry called reset,
16 which is used to reset the processor or start -- restart it
17 under a certain condition -- required that that changing of
18 the data from low to high be removed.

19 So it is my understanding that there are actually
20 two of these in here instead of one.

21 So I have labeled this as 2-14049.

22 the 14050, was considered by the circuit to add the data and
23 circuit to add the data and
24 circuit to add the data and
25 that it would be used to

Schoeffler - redirect

2002

1 So in order to make this change of circuit,
2 an extra one of these was put in there. The first one
3 changes the data, and the second one brings it back again.

4 So this function of the electronic circuit
5 is not changed at all and has no effect at all on the opera-
6 tion of the device.

7 Now, the last one over on the right is on the
8 test line of the microprocessor, and this is the one that
9 Frederiksen referred to as the priority line. This is the
10 one where you read the switches associated with the tilt and
11 the slam and the coins and the like. By interchanging those
12 two circuits and inverting this, this means that when you
13 look at the test line, instead of -- because this changes the
14 voltage from low to high or high to low -- when you see a
15 switch close, which would normally mean low, it now looks
16 high.

17 So this changes the way the switch signals
18 come in. So this had to be compensated for for a partial
19 change in one of the instructions as used in the computer
20 program.

21 So apparently on this board, this one chip,
22 the 14050, was replaced by the 14049, a change in this reset
23 circuit to add the extra one, and then there had to be a
24 change in the computer program of this one instruction, so
25 that it would continue to operate properly.

Schoeffler - redirect

1 Aside from that, there is no effect on the
2 operation of the Flicker pinball game due to these changes,
3 and so there is no significant change in the operation nor
4 significant effect due to these chip changes.

5 Q Dr. Schoeffler, were there any other portions of the
6 circuitry of the Flicker, the actual physical embodiment of
7 PX-333 which you determined were not identical with the
8 schematic diagrams which you have been testifying about?

9 As you identify those, if there are any,
10 could you please indicate how those would affect the operation
11 of the Flicker, if they have any effect at all?

12 A Yes, sir. This is the CPU board. There were some
13 changes.

14 I mentioned one of them in cross examination
15 yesterday; namely, in the solenoid that operates the flipper,
16 there was a change that made the solenoid run more quickly,
17 to pull in more quickly, some change there which was not re-
18 flected in an updating, or it did not appear on the circuit
19 diagram that we have been talking about, which is right --
20 well, this circuit diagram right here. That is, it is not
21 shown at all on the circuit diagram. It has nothing to do
22 with the invention or its operation. It is a speed-up
23 circuit on the solenoid, and that is the one that I mentioned
24 yesterday that, as part of that, there appeared to be a
25 resistor on the driver board that was cut for some reason.

Schoeffler - redirect

Q A second one was, on the driver board, there appears a large power resistor, which appears to be part of the voltage regulator circuit, and it does not show on the power supply portion of this schematic the use of that kind of a resistor, and the power supply is rather conventional and has nothing to do with the invention or the --

What? Well, it has to do with the operation of the power supply. That is what helps to make it function properly, but it has nothing to do with the invention.

A The only effect that I mentioned was, of course, that one chip change required the change in the test instruction so the switches were read properly, but aside from that, there was no effect whatsoever on my understanding of the operation of the Flicker which I determined from the study of the schematic and the computer program and the testimony of Professor Kahn, none whatsoever.

Q Dr. Schoeffler, are you aware that the last several weeks -- it was prior to the break sometime -- an exact paper printout of the instructions of the computer program that is contained in the E-PL0Ms of the Flicker, 42-151, has been generated?

A I was aware that the contents of those memories were dumped and printed on paper, as you say, yes, sir.

MR. BELMONT: For the Court's information, defendants had requested that such a printout be made, and we had

1 Q Dr. Schoeffler, prior to the five-week break, on direct
2 examination you testified that the representative claims read
3 on the Flicker based on your understanding of the operation
4 and construction of the Flicker at that time. You concluded
5 that each of the representative claims reads on the Flicker
6 based on your understanding.

7 What significance, if any, do these differences
8 which you have just testified about have on your analysis
9 of the claims reading on the Flicker?

10 A The only effect that I mentioned was, of course, that
11 one chip change required the change in the test instruction
12 so the switches were read properly, but aside from that, there
13 was no effect whatsoever on my understanding of the operation
14 of the Flicker which I determined from the study of the
15 schematics and the computer program and the testimony of
16 Frederiksen, none whatsoever.

17 Q Dr. Schoeffler, are you aware that the last several
18 weeks -- it was prior to the break sometime -- an exact paper
19 printout of the instructions of the computer program that is
20 contained in the E-PROMs of the Flicker, PX-333, has been
21 generated?

22 A I was aware that the contents of those memories were
23 dumped and printed on paper, as you say, yes, sir.

24 MR. SCHNAYER: For the Court's information, defendants
25 had requested that such a printout be made, and we had

1 cooperated with them and found a non-destructive method of
2 printing out the program as contained in those PROMs, and a
3 copy of that was done by Dr. Vacroux when I was present.

4 A copy of that was taken by Mr. Frederiksen, who
5 will be testifying later on. We will recall him for the
6 purpose.

7 He did what is called a disassembly of that program.
8 The program of the PROMs is contained in what is known as
9 object code, and to make it in a readable form for humans, he
10 turned it into what is called --

11 THE WITNESS: Symbolic.

12 MR. SCHNAYER: -- symbolic, excuse me.

13 A copy of that was given to Dr. Schoeffler for his
14 analysis to compare it with the program listing in the Patent
15 Office, and that is the testimony I am asking about now.

16 MR. GOLDENBERG: Your Honor, I suppose I made the
17 objection earlier with respect to this kind of testimony at
18 this time and the scope of the cross examination of this
19 witness. I take it your position is the same?

20 THE COURT: Yes, you may have a continuing objection,
21 and I am just taking it at this time, even though it is
22 beyond the scope of the cross examination. It still is a
23 necessary part of plaintiff's case. The witness is here, and
24 this is the logical time to do it.

25 MR. GOLDENBERG: Thank you.

1 MR. SCHNAYER: Thank you, your Honor. 2011, I think.

2 BY MR. SCHNAYER: giving us a memorandum on the position of

3 Q: Dr. Schoeffler -- the part of the patent claims, is that
4 is what the contention is here.

5 I am not troubled by the idea of patenting a
6 computer program because I believe that can be done. I
7 think there is law to that effect. What I am not clear on
8 is whether you can just simply file a program in computer code
9 and have that recited as a part of your claim.

10 Ordinarily I think of claims as something that
11 someone can go to the Patent Office and read and understand,
12 and what makes us ask this question is the thought that
13 maybe we have now entered an era that in order to understand
14 something, you have to go out and hire somebody to read it
15 for you.

16 Is that indeed the case now?

17 MR. SCHNAYER: Well, the patent is directed to a
18 person with ordinary skill in the art, a digital logic de-
19 signer.

20 The patent referenced an MCS-4 manual. It is not
21 written for just anybody. It is written and directed to a
22 certain type of person.

23 The manual that is referenced in the patent
24 application describes all of the instructions in the program
25 list, and that is perfectly acceptable --

1 THE COURT: While I am thinking of it, I would
 2 appreciate your giving me a memorandum on the question of
 3 a computer program being part of the patent claims, if that
 4 is what the contention is here.

5 I am not troubled by the idea of patenting a
 6 computer program because I believe that can be done. I
 7 think there is law to that effect. What I am not clear on
 8 is whether you can just simply file a program in computerese
 9 and have that regarded as a part of your claim.

10 Ordinarily I think of claims as something that
 11 someone can go to the Patent Office and read and understand,
 12 and what makes me ask this question is the thought that
 13 maybe we have now entered an era that in order to understand
 14 something, you have to go out and hire somebody to read it
 15 for you.

16 Is that indeed the case now?

17 MR. SCHNAYER: Well, the patent is directed to a
 18 person with ordinary skill in the art, a digital logic de-
 19 signer.

20 The patent references an MCS-4 manual. It is not
 21 written for just anybody. It is written and directed to a
 22 certain type of person.

23 The manual that is referenced in the patent
 24 application describes all of the instructions in the program
 25 listing, and that is perfectly acceptable --

1 THE COURT: But it doesn't have to be written in
2 English?

3 MR. SCHNAYER: Well, that is language to a com-
4 puter person. It is just like French or --

5 THE COURT: All right, give me some law to that
6 effect.

7 MR. SCHNAYER: Sure, your Honor.

8 THE COURT: And law to the contrary if the defend-
9 ants argue with that.

10 Now, if you agree on what the law is, then we don't
11 need a memorandum on it.

12 MR. LYNCH: No, may it please --

13 THE COURT: I don't know what the law is, and that
14 is why I am asking.

15 MR. LYNCH: No, your Honor, I just want it to be
16 clear that it is also our position --

17 THE COURT: That it is not part of the patent?

18 MR. LYNCH: And your Honor understands it is not
19 in the printed patent?

20 THE COURT: I understand that, but assuming that
21 it is somehow part of the patent, what I want to know is
22 how does that come about?

23 MR. SCHNAYER: Do you contend that that is not
24 part of the patent?

25 If it were part of the patent, you contend it

1 can't be used to interpret the patent?

2 MR. LYNCH: I contend it is not part of the patent.
3 I contend it was never intended to be part of the patent,
4 and I contend that no one could, without a further textual
5 explanation, read in what Dr. Schoeffler has read into
6 these claims under the patent law, yes, that is correct.

7 BY MR. SCHNAYER:

8 Q Dr. Schoeffler, I have just handed you PX446 and ask you
9 to your understanding, what is that?

10 A This is a copy of a document that it is my understand-
11 ing was prepared by Mr. Frederiksen and is what you a
12 moment ago referred to as the disassembled symbolic version
13 of the dumped program; that is, it is the symbolic version
14 of the program as it actually appears right now in the
15 Flicker memory.

16
17
18
19
20
21
22
23
24
25

Schoeffler - redirect

1 Q And just so the Court understands, maybe you can explain
2 the different columns that are here and compare and explain
3 what each of these lines mean with respect to what's contained
4 in the actual E-PROMs themselves.

5 A Yes, sir.

6 The instructions that we've been talking about that
7 the microprocessor actually carry out in symbolic form are
8 listed down the center of the document.

9 For example, the first one is an instruction called
10 FIM and FIN and JMS and FIM, et cetera.

11 Each of these instructions is explained in the
12 Intel manual as to what it does with data, whether it brings
13 data in or sends data out or adds two numbers together or
14 what have you.

15 THE COURT: Are you saying that a person of ordinary
16 skill in the art or arts that are involved here could read
17 this document along with the Intel manual and understand
18 exactly how this works?

19 THE WITNESS: Yes, sir, for the purpose of understanding
20 the operation of the patent and in particular the critical
21 things in the patent, the noise immunity things and the real
22 time organization of the program.

23 The typical engineer who studies computer program
24 is accustomed to actually writing this and reading it and
25 interpreting it. That is correct, sir.

1 MR. SCHNAYER: We'll get into some questions about that,
2 Your Honor, which I think will clear them up for you also.

3 THE COURT: All right.

4 THE WITNESS: And the other thing that is of interest
5 here is, in the third column of this listing, inside square
6 brackets, you observe numbers like 22, 24, 53, and further
7 down, A 0 F C B 0.

8 Those are the codes that actually are in the memor-
9 ies of the computer. And those are called object code.
10 They're just a series of numbers.

11 No one can read those and follow them. Laboriously
12 you can decode them by looking backward through the manual,
13 and so on, but it is very difficult to follow.

14 As a consequence, all design and analysis is
15 done with the symbolic version on the right, that with a
16 little practice one can learn to read rather well, especially
17 if you're accustomed to computers.

18 What Frederiksen did was to take what was dumped
19 from the ROMs, namely all these numbers, and work them
20 backwards to produce the symbolic listing so we could read it
21 and discuss it, and in particular tell what's different
22 about the actual instructions in the Flicker machine now
23 versus the instructions that were listed in the program that
24 was filed with the patent itself.

25 BY MR. SCHNAYER: Please identify what that is.

Schoeffler - redirect

1 Q Okay. Dr. Schoeffler, could you please -- strike that.

2 THE COURT: I want to keep this as brief as possible on
3 direct examination, and let the defendants go into it on
4 cross examination, if they contest what he is saying.

5 In other words, I don't want to go through this
6 whole computer program. Break.

7 MR. SCHNAYER: Well, he's just going to go through
8 examples -- differences that are contained in this program.

9 THE COURT: All right. Because I'm not going to under-
10 stand it anyway. P. 4467

11 MR. SCHNAYER: Yes. We've tried to do it so that your
12 Honor can understand it. We're not going through everything.
13 We'll try and go through just an explanation. Differences that
14 were THE COURT: All right. Is put a double asterisk where

15 BY MR. SCHNAYER: that differed between the one that was
16 Q. Dr. Schoeffler, do you have a copy of Plaintiff's
17 Exhibit 436 up there?

18 A. What is 436? To answer the question, what is different, we

19 Q. I think it's the program listing. and see their effects

20 A. The one that was filed with the patent? the significant

21 Q. Yes. any of the significant differences here. There are

22 A. Yes, sir, I have that.

23 MR. SCHNAYER: I believe the Court has a copy already.

24 BY MR. SCHNAYER: that there are only 3 asterisked instructions

25 Q. Could you please identify what that is.

1 A That is the symbolic version of the program that was
2 filed with the patent and is part of the patent, sir.

3 Q And did you use that particular version in your first
4 analysis of the operation of the Flicker?

5 A That is the version that I used prior to receiving
6 this sometime during the break.

7 Q Now, with the Court's instructions in mind, could you
8 explain the differences that are contained in this program
9 listing, PX-436, and the program listing which is actually
10 contained in the PROMs, PX-446?

11 A Yes, sir, I will attempt to do so.

12 When Frederiksen produced this new symbolic version,
13 what he did next to the column with all the numbers that
14 were dumped out of the ROMs is put a double asterisk wherever
15 he found something that differed between the one that was
16 filed with the Patent Office and the one that was actually in
17 the memory itself.

18 And so to answer the question, what is different, we
19 can look at the asterisked instructions and see their effects.

20 And I colored in what I considered the significant
21 -- a summary of the significant differences here. There are
22 several points.

23 First, you will notice that, taking a look just at
24 the first page, that there are only 3 asterisked instructions
25 on the first page.

1 Q More significant about that, however, is the fact
2 that all of the other instructions, not only are identical
3 to what was in the program that was listed with the Patent
4 Office, but they are at exactly the same location within the
5 ROMs.

6 A And that's why, I considered, that was a significant
7 point, that the other instructions had been copied.

8 Q And you said that you saw a computer program
9 that, at that time, was the same as the one that was --

10 that was the same as the one that was --
11 the same as the one that was --

12 A Yes, I think that's the point, or rather, if
13 he wants to explain the other part of it, Mr. Frederiksen

14 can explain that the other part was a copy of what was up being
15 that was --

16 Q And I think that's the point, it would be more efficient if
17 Dr. Schoeffler would explain the other part. These either

18 are or aren't significant, and the other part is a cross
19 example.

20 A Yes, any of the other parts of that, and they
21 may only have been used for two of them, and meanwhile

22 we've wasted a lot of time, and
23 so Mr. Schoeffler --

24 Q If you can explain that short and just a summary of --
25 A I'll try to do that, okay. And so that will summarize

Q Are these the same programs?

A These are the same programs.

The one that is in the ROM right now is simply a debugged version, further debugged version of the one that was filed with the Patent Office.

And that's why I considered this fact so significant, that the instructions had not been moved.

The normal practice in preparing a computer program then, at that time, when Frederiksen was doing something -- was doing this work, was --

THE COURT: Excuse me. Mr. Lynch.

MR. LYNCH: May it please the Court, your Honor, if he wants to explain the differences, fine. Mr. Frederiksen can explain what his practice was and how it wound up being that way.

THE COURT: I really think it would be more efficient if Dr. Schoeffler would just state his conclusions. These either are or aren't significant, and then let the defendants cross examine.

You may go through 30 of these things, and they may only take you on on one or two of them, and meanwhile we've wasted time on 28 things.

BY MR. SCHNAYER:

Q If you can keep it real short and just a summary of --

A I listed 6 conclusions, okay. And so that will summarize

1 them very well.

2 The first one is that the bulk of the program is
3 identical. That is, 88 percent approximately of these
4 instructions are identical to the original version and are
5 in exactly the same location.

6 This means that, when he loaded those instructions
7 in the program when he first created it from the version that
8 was filed with the computer program and then tested it, he
9 must have found errors or other things that either were not
10 working properly or at least working to his liking.

11 And he went in and --

12 THE COURT: Let me say this: He's going to be here to
13 say what went through his mind.

14 Why don't you tell us -- and I'll ask the questions:
15 Have you found any significant differences between these two
16 programs that would have anything to do with the operation of
17 the machine?

18 Now, if the answer is yes, let's see which ones they
19 are.

20 THE WITNESS: The direct answer to your question is,
21 I found no differences that were significant to the operation
22 of the Flicker machine in any of the sense that we've been
23 interpreting the patent or the claims.

24 That is, the structure of the organization and the
25 like I found to be identical.

1 Now, the operation of individual little modules
2 as, for example, what one does precisely when a coin is
3 discovered, was changed.

4 Just to take one example, it appears from this
5 diagram that the program he wrote, when you inserted a coin,
6 if it was supposed to give you 2 games, was supposed to make
7 two knocks, two sounds in the game. And I believe it made
8 only one.

9 And so he changed around the sequence of a couple
10 of instructions so it would make 2, which is what the game
11 rules say.

12 Many of the changes are of that nature. Okay.

13 Or they are actual errors. That is, he apparently,
14 when he wrote the program, made a mistake. He wanted to turn
15 on this light, and he accidentally turned on this light.

16 So he went in after the program had been completed,
17 made the changes, and put them in the ROM.

18 The other thing that is different about this listing
19 of instructions and the one that was submitted to the Patent
20 Office, is that the Patent Office is the full symbolic
21 program.

22 When you dump out what is in the ROMs, you also get
23 some data area called a transfer or a jump table, which
24 normally I assume that he entered manually after he had
25 prepared the program. And that appears here, and so it looks

1 different.

2 And what I did with the colored crayons is
3 circled this, and that portion of it is on Pages 6 and 7.

4 The only other change in appearance of this, other
5 than the asterisked changes, is at the end.

6 And because he was fixing errors -- if you just
7 have to make a small change to an instruction, you just go
8 in and change that instruction. But if, in order to fix the
9 error you have to replace one instruction by two, you can't
10 shove them all apart and stick two in.

11 And so what he was forced to do was put those
12 changes at the end of the program.

13 And so that is -- the net result of this is, of all
14 the instructions, roughly approximately 88 percent are
15 identical; I found approximately 5 percent of the 12 percent
16 that were changed were due to a commonly-occurring bug which
17 I would call a register assignment problem. It arises all
18 the time.

19 And 2 percent of those were due to having to jump
20 around to put the extra instructions at the end.

21 And the rest were just the correction of minor
22 errors here or there.

23 But I found that the operation of the program was
24 not significantly changed and would not have affected any of
25 my conclusions about the way the Flicker machine operated,

1 especially anything to do with noise prevention, noise immun-
 2 ity, the real time response, the sequencing, the offset in
 3 time, all of these things that are at the heart of the
 4 invention, there is no change in those.

9 BY THE WITNESS:

10 A I can use the...
 11 ...
 12 I had drawn from the...
 13 ...
 14 and took and...
 15 ...
 16 and the significance...
 17 ...
 18 ...
 19 ...
 20 ...
 21 ...
 22 ...
 23 ...
 24 ...
 25 ...

1 BY MR. SCHNAYER:

2 Q Doctor, I am going to ask you to do this quickly and
3 just summarize what these charts are.

4 I ask you to look at these charts and ex-
5 plain what they are.

6 We have PX-467-A and 467-B.

7 Can I have a copy for the Court, please?

8 (Brief interruption.)

9 BY THE WITNESS:

10 A I can use the one up here.

11 In order to be certain that the conclusions
12 I had drawn from analysis of the program that was filed with
13 the patent were no different after the change, I went back
14 and took and determined from the program that the symbolic
15 program that was filed with the patent, the way it operates
16 and the significant aspects of it, as I would expect someone
17 would do; namely, a digital logic engineer, after he had
18 studied the 4040 manual that is referenced in the patent to
19 learn to read the computer language -- so that he would be
20 able to learn what is going on in the system.

21 And I drew these diagrams, this one diagram,
22 one of which shows the structure of this program, and the
23 other of which shows what I have been referring to as the
24 executive loop.

25 The executive loop shows the key sequence of

operations that one goes through to cyclically and sequentially enable this single matrix multiplexing and carrying out the multiplexing, the reading of the switches, offset in time, and the like.

As it turns out, all of that is within the routines which I boxed on pages 1, 2, and 4; that is, he would start reading at the front and quickly discover that this routine, which is labeled "main" for the main routine is the one that controls this executive loop.

It shows the sequence we have gone through a hundred times now; namely, enable the lamps, enable the digits, wait a little bit, read the switches, respond, etcetera.

It also shows then in that sequence of instructions at the bottom of this executive loop on Exhibit 467-A the debouncing that we have been talking about.

It shows the double reading of the columns of the switches. It shows the double reading of the test line because they are very clearly labeled so in those of various modules.

This is the procedure's routines all going out and repeatedly during that interval doing the so-called operations, and that is what keeps the lights burning during that time.

THE COURT: Is that for just a minute.

1 And at the bottom it shows that when you have de-
2 tected that a switch is closed and you have to respond to it,
3 that as instructed in the text part of the patent, that you
4 go to subroutines -- is what Frederiksen called them. Those
5 are the various little modules with a name out to the left
6 that are in the program.

7 If one just examines some of those, you find ones
8 called the target routine, the spinner routine, the tilt
9 routine, and these are the routines that carry out the
10 functions with the obvious names.

11 I have also shown one routine that is different
12 from one of those over on the right-hand corner because, as
13 you read through each one, this, too, would leap out as
14 being significant, and I label this an example of a lengthy
15 routine.

16 This is intended to show that as you go through and
17 have to do lots of instructions that take a long time -- the
18 microprocessor is fast, but as indicated in some of the
19 testimony, to do a scoring routine may take a quarter of a
20 second, and that is too long to not do anything else.

21 This shows Frederiksen's routines all going out
22 and repeatedly during that interval doing the so-called mux
23 routine, and that is what keeps the lights burning during
24 that time.

25 THE COURT: Excuse me for just a minute.

1 THE WITNESS: Yes, sir.

2 THE COURT: Are we in the context of explaining
3 these problems that arose during the recess putting in the
4 direct case again?

5 MR. SCHNAYER: Well, your Honor --

6 THE COURT: This sounds like an endorsement of
7 the Flicker machine, which we have had a lot of so far.

8 MR. SCHNAYER: If I can maybe explain to the
9 Court, Dr. Schoeffler has drawn these structural charts.
10 Now, I will ask him to indicate --

11 THE COURT: I mean, what I have been hearing for
12 the last few minutes, it seems to me, is repetitive of the
13 testimony I have heard before about how the thing works and
14 why it is a good invention, and so on.

15 MR. SCHNAYER: Well, the issue involved is whether
16 that program listing which was submitted to the Patent Office
17 taught the invention, and that was one stage of the program
18 listing which was contained in the Flicker pinball machine.
19 There were some changes to it.

20 He has testified now about what is contained in
21 that one version.

22 What we are ultimately trying to conclude is it
23 taught a person of skill in the art what you need to do to
24 practice the invention. Now, these charts illustrate that.

25

1 THE COURT: Well, I think this really is direct
2 examination that might have been conducted weeks ago. This
3 is not something that becomes relevant only because it has
4 been learned that there are changes in the program.

5 MR. TONE: May I say a word, your Honor?

6 THE COURT: Yes.

7 MR. TONE: As I understand the purpose of this,
8 it is to show that the substance and thrust of the program
9 were in the programs that were offered initially and that
10 the changes shown by the dump program are not material.

11 THE COURT: It just seems to me that he has al-
12 ready said that here this afternoon on the examination by
13 Mr. Schnayer. Going through another few charts is not going
14 to make his testimony more understandable to me.

15 MR. SCHNAYER: If we could just identify the
16 charts for the record and possibly for --

17 THE COURT: Put them in.

18 MR. SCHNAYER: Dr. Schoeffler in a couple of
19 seconds can indicate what they are. That should be suffi-
20 cient, just so we have a record made.

21 THE WITNESS: Yes, sir. I drew these charts so
22 that --

23 THE COURT: Once he says that the program is essen-
24 tially the same -- I mean, we know that it has to be able
25 to operate the machine; otherwise the machine would not have

1 THE COURT: Well now, that is the kind of thing
2 You want to go into on cross examination.

3 MR. GOLDENBERG: That is right.

4 THE WITNESS: What should I do?

5 BY MR. SCHNAYER:

6 Q Again in a couple of sentences explain what these are
7 and what significance these charts are, just so we have an
8 understanding what they are.

9 A I drew these charts simply to show in detail that the
10 things that I had deduced from the program from the Patent
11 Office were not changed by any further examination of the
12 program that has been dumped, and this shows the structure
13 and organization of those routines in detail and the noise
14 prevention and immunity things, and they have not been
15 affected, in my opinion, by the dumped program.

16 Q Those charts, for the record, are what numbers?

17 A The exhibits are labeled 467-A and B, sir.

18 Q Dr. Schoeffler, would it have been obvious to a person
19 of ordinary skill in the art, having the program listing that
20 was submitted to the Patent Office, to make an operative
21 program for a particular microprocessor hardware system for a
22 pinball machine?

23 A In my opinion, a digital logic designer who was either
24 working with someone who was knowledgeable about game rules
25 and other characteristics of pinball games or himself had

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1 that knowledge could read the patent, find the reference to
2 the 4040 manual, understand it, and then produce the kind of
3 diagrams that I have shown here, which would teach him the
4 part of the invention that in software was critical and use
5 the unknown and not taught in the 4040 manual, namely, this
6 executive loop and the time offset and the noise immunity
7 considerations as they are shown here, yes, sir.

8 Q Dr. Schoeffler, the defendants have stated to the Court
9 that some of the parts contained in the Flicker have date
10 codes which apparently are later than September 26, 1974, which
11 is the date the Flicker was demonstrated to Bally.

12 Would you please explain what is meant by
13 those date codes?

14 A It is customary in manufacturing any product, and
15 especially electronic products, to put sufficient information
16 on the products so that quality control can be carried out,
17 and in particular codes which indicate the date of manu-
18 facture of these chips are normally included on each chip
19 so that at a later time if a chip fails or does not meet
20 specifications, the vendor, the manufacturer, that is, can
21 go back and determine when it was manufactured, with what
22 other chips, and the like.

23 So if you decode those numbers, you can tell
24 the approximate time of manufacture of the chip.

25 Q Dr. Schoeffler, certain parts on the Flicker board

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2029

apparently contain date codes which are after the September 26, '74 demonstration to Bally.

Assuming, one, that during the September 26 demonstration, the Flicker contained the integrated circuits with the same part numbers as those contained in the Flicker today and, two, that those parts were replaced with the parts which are actually in the machine today, what effect would this have on the operation of Flicker in your opinion?

MR. LYNCH: Objection, your Honor. One of the issues is was it demonstrated on September 26 and in what condition was it as of that date.

Q Could you, I think, your Honor, that insofar as if the witness wants to testify about the chip comparison, that is fine, but to make a theoretical or hypothetical question --

THE COURT: Well, he is being asked a hypothetical question. It doesn't hurt anything. Overruled.

A I understand that he doesn't know what took place. He has to assume.

Q Dr. Schoeffler, would a person of ordinary skill in the art have been able to trace the patented invention based on the disclosure in the printed patent or the program filed with the Patent Office?

A It is my opinion, and I just stated it in confidence with the witnesses and the executive loop flow chart that I described, that he could.

1 BY MR. SCHNAYER:

2 Q Can you answer the question?

3 A The question is assuming that -- I am sorry. Would you
4 mind repeating your question, sir?

5 Q Yes, assuming, one, that at the time of the demonstra-
6 tion the machine contained identical integrated circuits, the
7 same part numbers with date codes which were prior to
8 September 26, and now it contains date codes which are after
9 September 26, what effect would this have on the operation
10 of the Flicker, in your opinion?

11 A None whatsoever.

12 Q Could you please explain your basis for that?

13 A Well, if the components are identical, it would run
14 identically the same way, and it is normal in products that
15 if for some reason a component fails or for some reason you
16 take it out and replace it, you may have one with a later
17 date code; but if they are identical components, they should
18 not affect the operation of the device.

19 Q Dr. Schoeffler, would a person of ordinary skill in the
20 art have been able to practice the patented invention based on
21 the disclosure in the printed patent and the program filed in
22 the Patent Office?

23 A It is my opinion, and I just stated it in conjunction
24 with this structure chart and executive loop flow chart that
25 I described, that he could.

1 Q Dr. Schoeffler, during your cross examination you stated
2 that you thought that a debounce routine was used for the
3 switches in the test line, but to make sure you would have to
4 check the program to determine if this was true.

5 Have you had an occasion to check the program of
6 the Flicker to determine whether a debounce routine was used
7 on the switches which were connected to the test line?

8 A I examined the program during the break and determined
9 that software was not used to debounce the switches on the
10 test line, and in particular, of course, the slam and the
11 tilt lines, it is not appropriate to debounce those. The
12 whole idea is to respond quickly when those occur.

13 Yes. The debouncing of the other switches was apparently
14 done by the duration of the routines that was associated with
15 them. The length of time that it takes to do the coin
16 response routine, for example, apparently was considered
17 sufficient so that one did not have to use the same de-
18 bounce routine that was used in the other switches.

19 However, all the other switches in the machine did
20 use a debounce routine, and if it was necessary, that same
21 routine could have been used with the other switches if
22 Frederiksen had desired it.

23 Q What significance to the claimed invention, if any, does
24 the fact that the switches in the test line of Flicker did
25 not have a debounce routine, in your opinion?

1 A That has no effect, in my opinion, on the reading of the
2 claims, sir.

3 Q Dr. Schoeffler, I hand up to you Plaintiff's Exhibit
4 469. It is a 3-page document, entitled "Infringement
5 summary."

6 I ask you if you can identify it?

7 A Yes, sir, this is a chart which I put together to
8 summarize the various aspects that I have testified to for
9 the various games so that I could keep them straight.

10 Q Could you quickly go through and please explain what
11 the various columns are and what is meant by what is contained
12 in the infringement study?

13 A Yes, sir. Column 1 in this summary is the name of the
14 pinball game, and the three Williams representative games
15 and the two Gottlieb representative games are all mentioned
16 in the various columns. Then everything in the other columns
17 is grouped for each of those games.

18 I believe this is an accurate summary of what I
19 have found.

20 The second column in the summary is entitled "Micro-
21 processor," and it simply indicates that in each of those
22 games, there is a microprocessor doing control, as required
23 by the claims, and that is the significance of the word "yes."
24 In addition, I listed the particular microcomputer.
25 For example, the three Williams games used the Motorola 6800

family.

MR. GOLDENBERG: Your Honor, I object to this. The witness has prepared the document. I don't know that it requires all this explanation. It is a rehash of his direct testimony. I really think it is self-explanatory.

THE COURT: Well, if it is, I would like to let it go at that.

I was wondering myself. I mean, frankly, it is a helpful document for me to have. It is by way of a summary; it is not substantive evidence. It is a summary of what the witness has testified to, I assume.

MR. SCHNAYER: If the defendants agree it is self-explanatory --

THE COURT: If there is nothing in here that I wouldn't understand by reading these various captions, let's dispense with the explanation because it looks to me like I understand what it is.

MR. SCHNAYER: I think there is only one area which might need some explanation.

THE COURT: All right. I put in this to the things that

MR. SCHNAYER: Would you agree the rest of it is self-explanatory?

MR. GOLDENBERG: Well, it is self-explanatory as representing this witness' testimony, I suppose. Yes, I will agree to that.

1 THE COURT: Ask him the specific thing you want to
2 ask him.

3 MR. GOLDENBERG: I don't know. Mr. Lynch, do you have
4 any problem?

5 MR. SCHNAYER: You have no problem, Mr. Lynch?

6 THE COURT: I don't know that it makes any difference
7 whether they have any problems or not. It seems self-
8 explanatory to me.

9 MR. SCHNAYER: Thank you, your Honor. I am sorry.

10 THE COURT: I was waiting for some indication why it was
11 necessary to explain it, and I haven't heard it yet. So
12 let's not explain it, except for the one particular thing.

13 MR. SCHNAYER: The only column is the one where it says
14 "Combination of Noise Prevention and Noise Immunity Techniques
15 to Allow Operative Matrix Multiplexing," and then there is a
16 list for each game of various items.

17 BY MR. SCHNAYER:

18 Q Could you just tell me what those things are listed?

19 A Yes, that one may not be self-explanatory because I
20 restricted the things that I put in this to the things that
21 were in the Flicker game or directly equivalent to the things
22 in the Flicker game, so that I did not list additional hard-
23 ware noise prevention-immunity techniques that might be in
24 individual games in addition to it.

25 So that is restricted to those in the Flicker game.

1 The other columns I agree are self-explanatory.

2 THE COURT: All right.

3 BY MR. SCHNAYER: I think the chart is self-explanatory.

4 Q Dr. Schoeffler, referring to Mr. Lynch's exhibit he
5 generated, I think this is 19-J. Flicker picture, the

6 Do you recognize that as a chart that was --

7 A Yes, I do. Spiderman and Cleopatra, but in several

8 Q Dr. Schoeffler, do you believe that this chart is being,
9 accurate? No, misleading.

10 A No, sir, I believe that it is misleading.

11 In the second row, where it is labeled "Digit
12 Scan" and it is called "cyclic and sequential" under the
13 Flicker and the preferred embodiment, I had indicated it was
14 my opinion that it was cyclic and sequential for Cleopatra
15 and Spiderman, but nothing was entered.

16 In the row that is labeled "Digit Scan", Flicker
17 and the preferred embodiment, it is labeled "Cyclic and
18 sequential," and we had indicated that it was actually
19 cyclical and sequential also for Cleopatra and Spiderman,
20 but there instead of indicating the same words, so that
21 the comparison was obvious. The names of the chip types,
22 the hardware that are used there, were put in. As a con-
23 sequence, when one reads this out of context, it gives
24 the impression as though there were something different.

25 There is a similar thing in the solenoid lines
and others, but at any rate, I just believe the chart as it

1 Q Could you please explain in what ways you think that
2 chart is misleading?

3 A As I understood the purpose of the exercise in producing
4 the chart was to show the differences between the Flicker, the
5 preferred embodiment, namely, the Flicker machine, the
6 single matrix machine itself, and the Gottlieb games, repre-
7 sentative games, Cleopatra and Spiderman, but in several
8 rows the way that chart was written down, it ended up being,
9 in my opinion, misleading.

10 I will just give a couple of examples.

11 In the second row, where it is labeled "Switch
12 Scan" and it is called "cyclic and sequential" under the
13 Flicker and the preferred embodiment, I had indicated it was
14 my opinion that it was cyclic and sequential for Cleopatra
15 and Spiderman, but nothing was entered.

16 In the row that is labeled "Digit Scan", Flicker
17 and the preferred embodiment, it is labeled "Cyclic and
18 Sequential," and we had indicated that it was actually
19 cyclical and sequential also for Cleopatra and Spiderman,
20 but there instead of indicating the same words, so that
21 the comparison was obvious, the names of the chip types,
22 the hardware that are used there, were put in. As a con-
23 sequence, when one reads this out of context, it gives
24 the impression as though this were something different.

25 There is a similar thing in the solenoid lines
and others, but at any rate, I just believe the chart as it

1 stands is misleading, sir.

2 Q: Dr. Schoeffler, Mr. Lynch referred you to a portion
3 of the testimony of Donald Harmer, and in that testimony
4 it indicated that it was possible with a particular type
5 of switch scanning that occurred on Cleopatra that a switch
6 could be missed because of this particular technique of
7 when it hit a switch closure, it started at the beginning.
8 For the record, He gave you only a portion of that testimony, and
9 I would like you to read quickly through pages 136 and 139
10 and see if there is any conclusion by Mr. Harmer that would
11 indicate that his testimony in that regard was incomplete.

12 A: I notice down here on page 137 at line 23 where there
13 is a series of questions about how often this would happen,
14 and it says, "Do you recall any particular instances where?"

15 He answers: "No," if that refers to whether --
16 by Mr. JENNINGS:

17 Q: So Mr. Harmer indicates in his testimony that he never
18 observed any instances. He did not recall observing any
19 instances where this happened?

20 A: That is apparently what it means. It is an incomplete
21 sentence, of course.

22 Q: Now, if the designer of the game did not observe any
23 instances -- assume that is the case -- is it your opinion
24 that it is likely that the Cleopatra would have missed switch
25 closures as Mr. Lynch referred in his cross examination

1 (Brief interruption.)

2 BY MR. SCHNAYER:

3 Q Does Mr. Harmer indicate in there?

4 A Excuse me. I have to work through it, I am afraid.

5 MR. SCHNAYER: Excuse me.

6 (Brief interruption)

7 MR. SCHNAYER: I apologize for not having a copy
8 for the Court.

9 THE COURT: It is all right.

10 (Brief interruption)

11 BY THE WITNESS:

12 A I notice down here on page 137 at line 23 where there
13 is a series of questions about how often this would happen,
14 and it says, "Do you recall any particular instances where?

15 He answers: "No," if that refers to whether --

16 BY MR. SCHNAYER:

17 Q So Mr. Harmer indicates in his testimony that he never
18 observed any instances. He did not recall observing any
19 instances where this happened?

20 A That is apparently what it means. It is an incomplete
21 sentence, of course.

22 Q Now, if the designer of the game did not observe any
23 instances -- assume that is the case -- is it your opinion
24 that it is likely that the Cleopatra would have missed switch
25 closures as Mr. Lynch inferred in his cross examination

1 questions?

2 A It is unlikely and, also, the fact that it was a
3 commercial game and that it is a representative game, and
4 presumably others were designed just like it that were sold.
5 It is unlikely that it was a problem. It would hardly have
6 been acceptable in the intended environment of the pinball
7 machines.

8 Q Dr. Schoeffler, you testified previously about Williams
9 and Gottlieb representative games.

10 You had answered some questions on cross examina-
11 tion about certain solenoids which were under control, micro-
12 processor control.

13 Could you please describe generally, very gener-
14 ally, what the types of solenoids there were under micro-
15 processor control pinball games?

16 A Yes, sir.

17 In our discussion, we had indicated that, in
18 general, on these thumper bumpers and on the slingshot type
19 of things that the solenoids were direct driven; that is,
20 not caused to close by the action of the microprocessor it-
21 self except for an overall enabling; that is, permitting
22 them to operate during the time that the game was active.
23 There were several of those, approximately half in one set
24 of games, for example.

25 Then the other half were solenoids that pop up

1 targets and throw the ball out of outholes and the like, and
2 those were under computer control and processor control in
3 those games.

4 So some of them were directly under the control
5 of the processor, and some were so-called direct driven.

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Schoeffler - redirect

Q Now, the ones that were directly under control in the microprocessor, did they have any real time response constraints associated with them on the microprocessor system?

A Every event that can occur in a system like the pinball game ends up with some kind of real time response either because we have to kick out the ball in a reasonable time or we have to raise the switches in a reasonable time or because, and equally important, that because of other things going on concurrently, we have to synchronize things in real time.

For example, it was typical in the drop target. A drop target is a target that when the ball hits it, it falls down, and at a later time under the game rules, the solenoid has to pop them up.

When the target drops, you want to give the player credit for hitting the target, but when it jumps up again, he should not get any score increment.

So the real time constraint then requires that while that solenoid is being closed, for example, you do not do switch scanning. So this then becomes a combination of events that have to be carried out that way.

So they all enter into the design of the game because of the simultaneous events.

1 Q Now, Dr. Schoeffler, you discussed software techniques
2 that were described in the program listing that was filed
3 with the patent.

4 My question is, are there any software techniques
5 for noise prevention -- noise immunity, excuse me, which were
6 actually described in the text of the patent itself?

7 A Yes, sir. The offset in time or the time interlock
8 is disclosed very explicitly in the patent.

9 And at the very beginning of my direct testimony
10 when I went through noise references, that appears several
11 times in the text of the patent, and I referenced as part of
12 that testimony.

13 Q What is the approximate scan rate for the matrix multi-
14 plexing system disclosed in the patent?

15 A As disclosed in the patent it is approximately 60
16 times per second.

17 Q What is the approximate scan rate for the switch matrix
18 in the Disco Fever, Flash, or Black Knight games? Those
19 are the Williams games. This is the switch scan rate.

20 A The switch scan rate in the Disco Fever, which is
21 done in the background, I was not able to determine. I don't
22 -- of course, don't have access to the programs, and there
23 was no testimony about that.

24 When it was done in the Flash and Black Knight
25 games, the next two representative games, it was done on an

1 interrupt basis, and the entire matrix was scanned 500 times
2 a second. Very much more rapidly.

3 Q What significance if any does this have, this faster
4 scan rate have with respect to aborting of the switch scan
5 if it finds a switch that's closed and go back and start
6 again?

7 A In that game the switches are being looked at so often,
8 okay, it almost doesn't matter in what sequence they are done.

9 But in fact aborting the scan would make it highly
10 unlikely that one would miss a switch closure, because you're
11 coming back to them so very, very rapidly.

12 THE COURT: It's six o'clock. I suppose we'll
13 quit for the night.

14 MR. SCHNAYER: Thank you, your Honor. I should be
15 close to --

16 THE COURT: And I've got a doctor's appointment
17 at 9:30 tomorrow, and I hope it will be over in time for me
18 to be here by eleven. And if I'm not here at eleven, I
19 will be, I assume, very shortly thereafter.

20 So we'll shoot for eleven o'clock. Okay.

21 MR. SCHNAYER: Thank you, your Honor.

22 (The above-entitled cause was recessed until the follow-
23 ing day at 11:00 o'clock a. m.)
24
25